NOTES 1/6/69 BALCH

B 1/7

1/6 9:45

MISSION:

S-II-6 - Stage is installed in the Vertical Checkout Building undergoing insulation modifications. Other modifications not completed while stage was in test stand because of late delivery of kits are not being completed. Stage is expected to be ready to ship to KSC on 1/26/69.

S-II-7 - Stage is in the A-1 Test Stand undergoing pre-static checkout and modifications. X-ray and dye penetrant inspection inside the LH_2 tank on 12/28/68 revealed a crack about 18 1/2" above cylinder 3 to 4 circular weld between stringers 65 and 67. The crack has now been ground out satisfactorily and close-out of the LH_2 tank is completed. Cyrogenic proof pressure test is still set for 1/14/69, and static firing is scheduled for 1/11/69.

S-IC-8 - Full-duration static firing was successfully accomplished on 12/18/68. Stage was shipped to Michoud early Saturday, 1/4/69.

S-IC-9 - Stage is scheduled to arrive on dock at MTF on 1/9/69 and to be installed in the B-2 position of the S-IC Test Stand on 1/10/69.

BOMEX - The tape decks, major component of the Signal Conditioning and Recording Device (SCARD) were shipped from the vendor on 1/4/69. An attempt is being made to completely fabricate one SCARD for delivery to the ship "Discoverer" on 1/20/69 so that it may be used in ESSA's Atlantic Tradewind Experiment (ATEX) scheduled for 1/27/69. This exercise will afford an opportunity to de-bug the SCARD and make any necessary corrections prior to the BOMEX exercise. All other efforts are on schedule.

GENERAL:

Legal Affairs - As a result of the static firing of the S-IC-8 stage on 12/18/68, 19 allegations of property damage have been received. Formal claims against the Government have been filed on four of these, and it is expected that formal claims will be filed on at least four more.

NOTES 1/6/69 BELEW

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MDAC CONTRACT-MSFC DEFINITIZATION TASK TEAM: The task team met on December 23 and outlined a schedule of major milestones required to accomplish Center effort on the contract definitization by March 7, 1969. A letter to General Bogart outlining our plans and schedule is in preparation. We have been in contact with John Yardley, MDAC task team chairman, and they will send a program proposal to MSFC by January 17. Some additional Airlock Module requirements, requested by MSFC, will have to be handled as contract delta's since MDAC cannot propose on them by January 17.

LM-A SIMULATION PROGRAM: The LM/ATM neutral buoyancy mockup is in the MSFC neutral buoyancy tank at the present time and it is expected that the entire cluster (except the CSM and the LM crew provisions module) will be assembled in the tank by the end of this week.

PROPULSION TESTING AT WHITE SANDS PROVING GROUND: Representatives of MSFC and Grumman are visiting White Sands Proving Ground this week to establish the propulsion testing program for the reaction control system modifications being made to the LM propulsion system.

MARTIN INTEGRATION CONTRACT: Effort on definitizing the Martin Letter Contract for Payload Integration continues on schedule.

1. Technical evaluation of the tasks to be performed by Martin has been completed.

2. Initial evaluation of the manloading for the task has been completed. One problem relative to this manloading is an average of about 50 men per month more work defined than we have money to buy in the time period January 1969 through June 1969. This problem is being worked by deferring as many tasks as possible downstream.

3. Plans are to complete the technical evaluation and have a package ready for pricing on January 6, 1969. This is consistent with our plans to have a contract package to Headquarters by January 15.

NOTES 1-6-69 BROWN

GENERAL - The engines on AS-504 are in a high state of readiness. All engine modifications have been completed. The only open work is some minor leak checks which can be performed within routine procedures and possibly in-place cryogenic testing of all J-2 engine P.U. valves.

F-1 ENGINE - Based on our experience to date, it is highly probable that the temperature under the thermal insulation would drop below the launch redline value were the weather to be cold and windy (as was experienced at KSC a few days before the launch of AS-503). In an effort to preclude a delay in CDDT or launch under adverse weather conditions, Rocketdyne is proceeding with an engine system and component test program designed to investigate cocoon temperatures which are below the Model Specification and launch redline value. In addition, KSC is being requested to investigate varying the heat input to the cocoon when cold weather could be expected.

J-2 ENGINE - Reference my notes of December 16, 1968. It was erroneously reported that the thrust bearing of the P.U. valve actuator motor was installed backward. Further inspection revealed the bearing to be installed correctly. The Belleville spring that preloads the bearing was not to print and a motor end cap was machined eccentric 0.005 in. where the drawing allows a maximum of 0.0002 in. Cold tests of the motor verified the bearing outer race was not free to slide in the end cap bore as required. Rocketdyne is devising a test procedure that will allow P.U. valve actuators to be tested in place for screening. This test procedure will be correlated on the S-II Battleship early next week.

During the flight of AS-503, engine number 5, center position S-II stage, experienced performance parameter oscillations of 18 cycles per second at approximately 453 seconds and became more pronounced at 480 seconds. The oscillations damped out shortly before engine cutoff. There also appeared to be some low amplitude 10 and 18 cycle per second oscillations in all S-II engines. However, analysis of the problem has been hampered because copies of the data supplied to the various contractors are not consistent. A committee, consisting of personnel from Rocketdyne, Space Division and MSFC (chaired by R-P&VE-P), has been established to review the oscillation problem in depth. Also, Rocketdyne is studying the feasibility of simulating the oscillations in ground testing.

NOTES 1/6/69 CONSTAN

1/6 8PS

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Best wishes from the Michoud staff for a happy and challenging new year.

B 1/7

NOTES 1-6-69 Downey

1/6 MSFEB

1. SEISMIC OBSERVATIONS ON APOLLO 8 LAUNCH: The oscilloscope traces from the data tapes obtained during the Apollo 8 launch have been studied by Dr. Dalins. Maximum amplitudes (approximate values) of the seismic disturbance as detected by the buried seismographs on the crawler way are as follows:

a. Depth of 38 feet - approximately 80 microns in vertical direction
b. Depth of 25 feet - 100 microns
c. Depth of 8 feet - 130 microns

In qualitative terms these amplitudes of displacement should be regarded as large and of some concern to various launch activities at KSC. It is now believed that a rather simplified picture in regard to the mechanism that causes these seismic signals can be proposed. Most of the seismic disturbances are generated by shock waves in the exhaust gases of the rocket engines. This is apparently producing the seismic signal modulation that is evident in the data traces. The interaction with the ground is primarily due to resonance coupling (single frequency and its harmonics).

2. LASER ABSOLUTE GRAVIMETER: As a result of a request from NASA Headquarters, Dr. Hudson of SSL presented the status of the laser absolute gravimeter to members of Dr. Allenby's Lunar Exploration Office. They seemed to be well pleased with the progress of our work and promised to continue funding. We feel that the feasibility of the device has been proven, and a second generation laboratory model is now nearing completion. This development was initiated several years ago. Dr. Hudson conceived the principle of the instrument and is serving as Principal Investigator. Excellent support has been obtained from Test Laboratory in this effort. The gravimeter will be one of the highest priority scientific instruments on the Dual Mode Lunar Roving Vehicle, and this laser absolute gravimeter is a candidate type gravimeter for the LRV application.

3. SOIL MECHANICS INVESTIGATIONS: Dr. Costes has been requested by the Lunar Exploration Office to submit an Experiment Implementation Plan for soil mechanics investigations on the first Apollo lunar surface mission. An experiments summary form has been delivered to Mr. Ed Davin of the Lunar Exploration Office. This experiment will be discussed at today's (January 6) meeting of the MSFEB. The opportunity for a specific soil mechanics experiment became possible when certain changes in the planning for the first lunar surface mission were implemented, e.g., removal of ALSEP and reduction of geological investigations.

NOTES 1/6/69 GEISSLER

1/6 TS

B 11 7

1. Vibration Measurements During 503: Some vibration was measured just prior to S-II cutoff during the AS-503 flight. The dominant measurements were:

Location	Direction	Frequency (Hz)	Amplitude(g)
S-IVB gimbal	Long.	18	.6
CM	"	9	.16
CM	Yaw	9	.1

The 18 Hz is a longitudinal mode found during dynamic test which is predominantly S-IVB LOX tank bulging. The 9 Hz vibration is a subharmonic of the 18 Hz and was also measured on the dynamic test. Some lateral coupling at the same frequency due to S-II engine motion also exists. The flight ratio of vehicle modal response to force was much lower than the dynamic test values. We are trying to make a quick evaluation to see if the changes for 504 will make the longitudinal-lateral coupling problem worse.

2. Jimsphere to be Displayed in France: The Jimsphere balloon, developed by our Aerospace Environment Division for detail wind profile measurements, has been selected to be shown at Fifth Session of Commission for Instruments and Methods of Observation of World Meteorological Organization to be held in Paris in Sept., 1969. Jimsphere will be exhibited by French Meteorological Service at their facilities field station at Trappes (near Paris). 50 member countries of the United Nations will be represented. We learned recently from a USSR visiting professor at Penn State, that Russian National Academy of Science plans to use Jimsphere on turbulence measurement studies.

3. Remote Detection of Aircraft Trailing Vortices: Strength of wing trailing vortex systems from aircraft such as Boeing 747 Jumbo-jet and C-5A in the 700,000 lb. class, will be more than twice the vortex strength of present day operational transports. In order for pilots in airport traffic areas to avoid wakes from such aircraft, it would be advantageous to detect this turbulent environment from some suitable ground based instrument. Consequently, NASA Headquarters asked us to consider the feasibility of developing a vortex detection system for use during terminal area operations, using a CO_2 doppler laser instrument. Raytheon has developed an instrument which has most of the features needed for detecting trailing vortex environment. Therefore, arrangements were made to employ the system to determine the feasibility of whether aircraft vortex signatures can be detected by ground based doppler laser systems. This program is closely related to our efforts of using doppler laser systems to map turbulence and wind profile environments for launch vehicle operations. Langley is participating in this program with us, as an OART representative.

4. Planetary Atmosphere Models: Model Atmospheres for Mercury prepared by O. H. Vaughan this past year have been furnished to Mr. A. Beck, JPL, for inclusion in NASA's Mercury Environmental Design Criteria Monograph which JPL personnel have been preparing. A paper by Mr. O. H. Vaughan, discussing these Mercury Atmospheric Models, was accepted for presentation at AIAA 7th Aerospace Sciences Meeting in New York on January 20-22, 1969.

NOTES 1-6-69 GRAU

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1/6 AD

1. The Q&RA Laboratory extends to you and the members of your office the best wishes for a most successful 1969. The Laboratory has tried to help you carry the burden which is connected with the work on unique and extraordinary projects. We have mainly attempted to identify, measure, and minimize the risks involved with the Saturn programs. We will continue to do so to the limit of our knowledge and ability so that you may devote your time again to the difficult task of heading up the present program and of shaping NASA's and MSFC's future.

2. ENGINE PROGRAMS - 1968: One J-2 and one F-1 engine were selected at random from production at Rocketdyne and delivered to this Laboratory for complete disassembly and overall quality evaluation with respect to compliance to drawing and specification requirements. Reports of findings were issued by this Laboratory.

   Three quality surveys were conducted at Rocketdyne during the year. Two were routine and one covered the ASI assembly after the AS-502 failure. The surveys resulted in significant improvements in the Rocketdyne quality assurance system, and added confidence in quality and reliability of our engine hardware.

   A program was initiated to have Rocketdyne field quality assurance personnel conduct a final "shakedown" or "walk-through" inspection of engines immediately prior to rollout at KSC, to identify discrepancies such as misrouted lines or cables, improper clamping, missing protective equipment, damage, etc. Discrepancies are corrected and recurrence control initiated.

   In lieu of the Quality Maintenance Program, which was not economically feasible nor practical at this point in our engine development, we initiated an engine Flight Assurance Test Program with Rocketdyne. The program will retest and evaluate selected, critical, flightworthy spare components, representative of F-1 and J-2 components installed on the Apollo Saturn program launch vehicles. This effort will eliminate the six-month functional test now required for selected critical components and should eliminate the quality verification test program in this Laboratory.

   We also initiated the review of engine Modification Instructions by our resident quality personnel; to add mandatory government inspection points which will be verified in the field where the modifications are accomplished. A similar activity was initiated on Engineering Field Inspection Requests (EFIR), but this activity will be accomplished at the time the EFIR is reviewed and approved at MSFC.

   A program was initiated whereby Rocketdyne will review and certify the engine logbooks of the stage contractors prior to the flight of each vehicle. This effort will give added assurance that all field modifications and inspections were accomplished and that proper retest and validation were performed.

NOTES 1/6/69 HAEUSSERMANN

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1. ATM RF/Telemetry Systems. A meeting was held in early December with Mission Operations and Project personnel from MSC to discuss different hardware configurations which would enhance the overall retrieval of ATM data and provide mission operations flexibility. A summary of the agreements made are as follows:

a. A third VHF transmitter will not be added to the ATM system. With the present two transmitter system some data would be lost if one of the transmitters failed; however, the added cost and complexity does not warrant adding a third transmitter to protect against the loss of a small amount of data. Crew safety or EVA capability is not compromised if one transmitter fails.

b. RF coax switches and multicouplers will be added. The switches will allow either of the two transmitters to feed either of the two antennas and the multicouplers will allow both transmitters to feed either of the two antennas. Determination of which mode to operate in will be accomplished by Mission Operations personnel assessment of the data received and switching via the RF command link.

c. The backup tape recorder will be switched on to enhance the retrieval of significant scientific or mission data. The recorder capability covers one orbit and there are approximately two orbits per day during which ground station coverage is not adequate to receive all data from one recorder. The prime intent for the backup recorder has been to utilize it only when the prime recorder has failed.

Formal ATM change actions are being processed on these items and are expected to be implemented accordingly. These changes will satisfy both MSC and the PI's and not have any significant ATM impacts.

2. CMG Vehicle Simulator. The 20 ton three axis CMG vehicle simulator was received last month and is in the process of being set up to accept CMG's. We will advise you when it is in operation and when it would be appropriate for you to visit the Lab to become familiar with its use.

NOTES 1-6-69 HEIMBURG 1/6/69 B 117

1. APOLLO MATERIALS AND PROCESSES HANDBOOK: In December, 1966, Dr. Mueller suggested that MSFC and MSC collaborate on the preparation of a Materials and Processes Handbook to include manned space flight experience with materials incompatibilities, stress corrosion, and hydrogen embrittlement and to describe desired materials and processes for use on manned space flight programs. These directions were augmented subsequently to include materials flammability data. In cooperation with MSC representatives, we outlined a program to accommodate this suggestion. Because of the immense size of the program, NASA Headquarters gave The Boeing Company-TIE (TBC-TIE) a directive to develop and implement the handbook. After over a year of working the task, TBC-TIE presented their plan to MSF. The plan included the development of a multi-document library. Subsequently, the TBC-TIE task was withdrawn. Apparently, General Phillips so informed Dr. Mueller who still insisted the information be assembled. Recently Mr. J. Kingsbury was contacted by General Phillips' Deputy for Engineering who asked if we could undertake the task if we were provided funding. He had discussed the situation with representatives of OART who suggested that they would be interested in such a document and might be able to provide the funding. We agreed to discuss the situation further with him in January. We still see this as a monumental program with a cost approximating $5M.

2. ORBITAL WORKSHOP COATINGS AND MATERIALS: (a) Significant progress was made in the resolution of internal and external coatings to satisfy thermal and other requirements. Coatings which very closely approximate the Loewy/Snaith recommended color schemes for the Orbital Workshop interior have been identified, and some final determination on color schemes can now be pursued. (b) In order to eliminate some material and facility problems, we have been studying methods to reduce the cure temperature of our inorganic paint formulation. A modification has been accomplished to give the pigmentation proposed by Loewy-Snaith a maximum of 170°F cure temperature, and a nonflammable coating. With this breakthrough we have, pending additional qualification, a coating that could be applied to fire retardant liner of the OWS internal insulation subsequent to installation and still meet all other requirements.

3. S-II AS-503 CENTER ENGINE THRUST OSCILLATIONS: Significant 18 Hz oscillations existed in center engine parameters, while 10 Hz oscillations existed in outboard engine parameters during the latter portion of S-II flight. It appears that all launch vehicle to spacecraft structural interface criteria were met and structural limits were not exceeded. A special group representing P&VE, ASTR and COMP Laboratories and the contractors has been identified to review all data and determine the cause of the oscillations.

4. "B"-MINI S-II-4 FORWARD SKIRT: On 12-20-68, the "B" structure was destroyed by an explosive force. The cause is still being investigated. Due to the loss of our test specimen, we have analytically evaluated the structural integrity of the S-II-4 forward skirt. Utilizing temperature influence and structural data from applicable previous tests, a factor of safety in excess of 1.30 has been calculated for the S-IC CECO (center engine cut-off) condition for AS-504 thru AS-510 operational trajectory parameters. It is our conclusion that the forward skirt is structurally adequate for Apollo missions.

NOTES 1-6-69 HOELZER

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NEGATIVE REPORT.

B 1/7

NOTES 1-6-69 JAMES

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1. Apollo 8: From time to time, we have naturally worried as to whether critical technical personnel have drifted away from their specialities on Saturn V. During 503 preparation, we had occasion to examine many random, critical subsystems. We always found the right people hard at work on any concerns we had. I would like to take this occasion to thank all who made 503 such a fine success.

That's good to know. Surely reassuring. B

2. Apollo 9: Transfer to Pad A completed on 3 January 1969. No major problems.

NOTES 1/6/69 JOHNSON

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Status of FY-1969 SRT Program - The following report reflects status of MSFC's ART, SRT and Supporting Development Program through December 27, 1968:

	Annual Plan	Program Authority	Initiated % of Auth.	Obligated % of Auth.
OART	10,807,000	10,557,000	46.4	5.2
MSF	6,400,000	6,400,000	77.8	8.3
OSSA	1,383,000	850,000	33.9	20.5
OTDA	300,000	0	0	0
	18,890,000	17,807,000	55.5	7.3

Late receipt of program authority and technical comments from all four Headquarters Program Offices has significantly delayed implementation of this year's procurement actions. Obligation schedules developed jointly by the laboratories and this office call for initiation of more than 90% of our total FY-1969 resources by January 24th.

OMSF Supporting Development Quarterly Review - This review is tentatively scheduled for January 28, 1969, at KSC. MSF Centers will present material pertaining to obligation status (problems and forecast) of the FY-1969 program.

Supporting Development Agenda Item for January 7, 1969, Management Council Meeting - Doug Lord will brief the Council on this subject. He will review the fiscal and management decision history of the program and raise a number of questions pertaining to future plans for the program. A detailed information sheet has been submitted for inclusion in your briefing folder prepared for this meeting.

NOTES 1/6/69 MAUS

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NASA FY 1970 BUDGET

The Budget Transmittal Memorandum No. 70-6 (NASA Headquarters through MSF, Kubat) dated December 17 indicates a $3.878B NASA FY 1970 Budget. This is very close to the $3.877B settlement Dr. Paine and President Johnson made on November 26. However, some changes have been made to the budget structure. MSF's programs have been categorized as Apollo, Advanced Missions, and Space Flight Operations. Space Flight Operations is a single budget entry made up of Apollo Applications and Space Station. Lunar Exploration and Supporting Development are included with Apollo. The Administrative Operations Appropriation will be referred to as Research and Program Management (R&PM) Appropriation although no effect on the budget structure within the appropriation is anticipated. A comparison of the BOB "mark", NASA reclama and present status is shown below.

	BOB "MARK"	NASA RECLAMA	PRESENT STATUS
TOTAL NASA	$3,623.0M	$4,074.2M	$3,878.0M
R&D	2,929.0	3,369.5	3,168.9
C of F	49.9	60.6	58.2
Research and Program Management	644.1	644.1	650.9
TOTAL OMSF*	$1,833.6M	$2,113.7M	$2,007.7M*
Apollo (incl. Lunar Exploration and Supp. Dev.)	1,622.1	1,742.1	1,651.1
Space Flight Operations (Incl. AAP and Space Station)	209.0	369.1	354.1
Advanced Missions	2.5	2.5	2.5

*Distribution of the FY 1970 Budget (received verbally from MSF) by Installation as follows:

	TOTAL	MSFC	KSC	MSC	Hdqtr. & Other
OMSF	$2,007.7	690.7	340.4	920.8	55.8
Apollo	1,651.1	503.7	324.7	779.9	42.8
Space Flight Operations	354.1	186.1	15.5	140.0	12.5
Advanced Missions	2.5	.9	.2	.9	.5

NOTES 1/6/69 MURPHY

1/6/68

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1. Mini-B Test Stage Explosion: Based on the preliminary findings of the investigation board on the S-II Mini-B Test Structure explosion as it relates to the O_2 content in the hydrogen tank and liquid hydrogen transfer lines, we have or are taking the following actions:

a. Recommended postponement of a Battleship tanking test which was to have occurred at Santa Susana on January 3, 1969 (postponed by Saturn Program Office) until the Mini-B investigation is complete and detailed procedures are reviewed.

b. We are currently reviewing detailed MTF tanking and pre-static firing procedures to insure that a similar potential situation is not present. This review will be completed prior to January 10, and a release given to MTF on or before that date; no schedule impact will result on S-II-7 activity at MTF.

c. Will provide KSC information and recommendations to insure complete understanding of the accident so that they take required action.

2. Trailer Fire: Investigation of the fire which occurred in the trailer at building 4487, December 14, 1968, has revealed that the fire most probably originated in the power supply to the Packard Bell 250 Computer. Electric power had been left on so that system components remain at a constant temperature. The investigation further revealed that the automatic CO_2 fire suppression system failed to operate because of insufficient electrical power from the 6-volt exitation battery. Two of the three cells were dry. The remaining CO_2 systems (8) installed in similar trailers on the Center were checked, and three of these were found to have defective batteries and one was wired incorrectly for automatic operation. All conditions have been corrected.

Specific investigation board's recommendations will provide additional corrective measures, however, the individual laboratories and groups will have to continually remain alert to prevent such occurrences from being repeated in the future.

NOTES 1/6/69 RICHARD

B 1/7

No submission this week.

NOTES 1-6-69 SIEBEL

1/6/69

B 1/7

1. MDA: The Structural Test Article is progressing on schedule. It was delivered to R-QUAL, Monday, December 23, for inspection and pressure test. It is due to return to R-ME, January 14, 1969, for final manufacturing operations prior to structural testing.

2. OWS Solar Array Substrates: These panels are to be as light as possible. They consist of face sheets, core and formed channel edge members. They are considerably more difficult to manufacture than were the ATM panels. The difficulties arise from:

a. The thinness of the face sheets which are now .008" thick only (versus .015" for ATM).

b. The integral bonded edge channel which must be incorporated with a minimum (ideally zero) step in the face sheet at the junction of this edge member and the core (versus no edge members on ATM).

We are making 12 of these 27" x 30" x 3/8" thick panels for acoustics and structural tests.

3. Manufacturing Engineering Support to DOD:

a. This laboratory was asked by Continental Engines to assist in the development of a welding repair technique for aluminum reciprocating engine components which are being returned to this country from Viet Nam for rebuild. Typical damage was caused by bullet and shrapnel penetrations A satisfactory repair procedure has been developed with relatively little effort and is being transmitted to Continental Engines. This repair procedure can result in substantial savings to the government. The rebuild work for this contract is being performed by Continental Engines located at Brookley Air Force Base, Mobile, Alabama.

b. In a recent letter from the U. S. Army Logistical Command on Okinawa we were requested to suggest repair procedures for cracked chassis frames in heavy trucks evacuated from SE Asia. The frames are not weldable. We submitted a detailed procedure using adhesives and doublers. We specified the adhesive, the doubler geometry, and the method of application. We also sent samples of doublers and adhesives for test purposes.

B1-7

NOTES 1/6/69 SPEER

1/6 AS

1. AS-503 Slingshot: The Goddard orbit determination of the S-IVB following LOX dump and APS ullage burn and based on S-band tracking had the following results: Closest distance to the lunar surface occurred on December 24 at 10:49:28 GMT and was 1,260 km. The heliocentric orbit has a period of 335 days, an aphelion of 0.99 AU and a perihelion of 0.92 AU. Dr. Lundquist (Smithsonian) is trying to verify these results with Baker-Nunn data.

2. AS-504 Wind Limits: KSC has completed the Swing Arm #9 modification prior to roll-out. The vehicle is leaning toward the LUT only 2 in. as compared to 8 in. on AS-503 (combination of leaning and swing arm misalignment). This will substantially increase the wind capability. As yet incomplete is the promised installation of extensometers to measure the direct displacement between vehicle and swing arm. R-P&VE and R-AERO are generating wind limits and bending moment redlines. In addition, studies have been initiated to utilize the measured wind profile rather than a single level (60 ft.) wind speed. I have scheduled a briefing for Rocco Petrone on 1/28 (tentative) to make sure that he understands the nature and value of all wind constraints and to avoid a repeat of the misunderstandings experienced at the AS-503 FRR.

3. AS-503 Flight Data: The delivery of flight data recorded at the network stations, ships and Apollo aircraft is essentially complete, including coverage of the S-IVB second burn. Daily conferences were held with GSFC personnel who helped very effectively in expediting all L/V data needed for engineering analysis.

B 1/7

NOTES 1/6/69 TESSMANN

1/4 B

PREMIUM PAY FOR EXPOSURE TO HAZARDS:
We have learned that the Army is paying "hazard pay" to a group of people involved in testing the Lance missile. This increases the pay of an individual by 25% when exposed to a hazard. This could create serious repercussions here at Marshall in terms of additional requirements for A. O. funds, since we have some programs involving the same propellants and also because of the precedent it sets. The Safety Office and the Personnel Office are aware of this situation.

Dave Newby
Your comment is invited
B

BUILD-UP OF SPACE STORAGE CHAMBER:
The fabrication of the Auxiliary Propulsion System-Space Storage Chamber is on schedule and is scheduled to be moved to the installation site in mid January. This top opening, 20"-6" diameter chamber was designed in-house, utilizing the lox tank from the Static Test Tower West. It will have the ability of long term storage (6 months) and hot firing at 10^{-6} Torr with temperature ranging -40° to 140° F. The chamber will be connected to existing steam ejector system and will be built almost totally from in-house stock materials except for specialized pumping and control equipment.

S-IVB BATTLESHIP (MSFC):
A lox tank pressurizing module test was conducted on Friday, 1/3/69, to determine if low temperature was the cause of failure of the previous module from S-IVB-503. A flow system using LH_2 was utilized and after approximately 1 hour, decreased the valve body temperature to -325°F, with no apparent failure as indicated from preliminary data. The previous module had failed at ~~-350°~~ -300° F body temperature. Test Evaluation is continuing.

F-1 ENGINE:
Test FW-105 is rescheduled for January 9, 1969, with F-1 Engine S/N F-2009-1 at the F-1 Test Stand. Primary test objectives will be to determine the effects of self induced 30-35 Hz. fuel system oscillations on the lox system transfer gains and to determine the values of the turbopump operating parameters at which self induced 10-13 Hz. and 30-35 Hz fuel system oscillations occur. During these periods of self induced oscillations, the lox system will be pulsed at 6 and 10 Hz. These tests are for additional information to better understand the POGO phenomenon.

NOTES - WILLIAMS - 1/6/69

B1/7

1. Space Station Study: The Technical Committee (of the SEB) met in Hdqrs. on Jan. 2 to prepare a proposal to present to the SEB regarding: (a) How the committee would organize; (b) List of participants; and (c) Criteria and procedures for conducting the evaluation. A proposal was worked up and agreed to by those concerned (Hdqrs., MSFC, MSC, KSC, and LRC). The Technical Committee agreed that five evaluation panels be proposed: (a) Requirements & Evaluations; (b) Systems Engineering; (c) Design & Development; (d) Operations; and (e) Costs, Schedules, & Management Plans. The proposal was presented to the SEB on Jan. 3 and the board was instructed to consider the material and be prepared to resolve the matter at the next meeting on Jan. 10.

During the SEB meeting it became evident that the intent of the currently written statement of work was not exactly in line with the views of Dr. Paine or Dr. Mueller even though Mathews and others agreed with the present planning, statement of work, etc. Mathews was asked by the board to clarify this matter or get it resolved prior to the Jan. 10 meeting. The schedule we are working toward is as follows:

Procurement Plan/D&F Approval	Jan. 6
SEB Complete RFP Package	Jan. 15
RFP released to bidders	Jan. 20
Proposals Due	Mar. 3
Proposals Evaluated	Apr. 1
SEB presentation to Administrator	Apr. 15

2. Lunar Roving Vehicle (LRV): Several MSFC personnel visited U.S. Army Waterways Experiment Station at Vicksburg, Mississippi on Dec. 17 to discuss use of their facility for testing wheels for the LRV. We are planning further meetings to work out details of their possible involvement in the program.

A trip was made to the Apollo Lunar Exploration Office (MAL) at Hdqrs. to discuss development plans and status of science packages for the LRV Study. Many of the potential scientific instruments are funded. The Lunar Science Office of MAL will provide MSFC with a list of these instruments and their status.

Jan 13 1969

2469

February 4, 1969
In reply refer to:
I-V-E-86-69

NOTE TO : Dr. von Braun, DIR

FROM : Manager, Saturn V Program, I-V-MGR

SUBJECT : AS-504 Sloshing Stability

REFERENCE : Your comment on Dr. Geissler's Notes of January 13, 1969

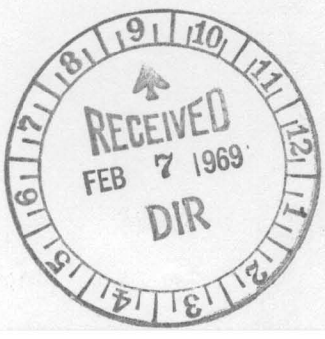
After a thorough review of Dr. Geissler's analyses and rationale, I feel the launch of Apollo 9 will not be impaired because of sloshing instability. Aero-Astrodynamics, working in conjunction with The Boeing Company and Astrionics Laboratory, has performed an in-depth analysis of slosh stability for the S-IC stage to identify those parameters which influence the critical or questionable low slosh wave amplitude. The procedure of incorporating data gleaned from earlier flights in the refinement of those variables used in previous slosh stability analyses has verified that stability margins we felt existed on earlier S-IC flights were probably not as broad as was indicated.

Aero, by amplifying their initial math model to include a combination of those variables which influence the S-IC margin sensitivity, is able by dynamic simulation to indicate that reasonable limit cycle amplitudes will not be exceeded on AS-504.

It is confidence in the results demonstrated by the above analyses that leads me to share Aero-Astrodynamics' conclusion that sloshing stability will not be a problem on Apollo 9.

for Lee B. James

1 Enclosure:
Dr. Geissler's Notes



B 1/18

NOTES 1-13-69 BALCH

1/13 9 PS

MISSION:

S-II-6 - Stage is in the Vertical Checkout Building undergoing insulation modification and other modifications not completed prior to removal from the test stand. All work is on schedule for shipment to KSC on 1/26/69.

S-II-7 - Stage is in the A-1 Test Stand undergoing pre-static checkout and modifications. Delay in installation of insulation modifications has caused the cryogenic proof pressure test to be rescheduled from 1/14/69 to 1/15/69.

S-IC-9 - Stage arrived at MTF on 1/9/69 and was installed in the B-2 position of the S-IC Test Stand on 1/10/69. Power-up and static firing are planned for 1/29/69 and 2/19/69, respectively.

BOMEX - It is now expected that a prototype of the Signal Conditioning and Recording Device (SCARD) will be ready for delivery to the ship "Discoverer" at Port Everglades, Florida, on 1/24/69 for use during this ship's participation in ESSA's Atlantic Tradewind Experiment (ATEX) scheduled to begin on 1/27/69. Communication channels have been established for feedback of SCARD performance date during this exercise.

GENERAL:

GE Service Contract - Amendment No. 162 to contractually implement a reduction of $2,476,000 in estimated costs has been approved by MSFC and forwarded to GE/MTSD for signature.

DIR

B 1/18

NOTES 1/13/69 BELEW
1/13 PS

MARTIN CONTRACT DEFINITIZATION: The prenegotiation position on the Martin contract was reviewed within the Center, with Headquarters personnel present, on January 10. Headquarters' approval of our position has been requested and we expect to commence negotiations immediately upon approval.

MDAC SYSTEMS ENGINEERING CONTRACT: It appears that the McDonnell Douglas Astronautics Company (MDAC) cost proposal will amount to almost twice the current level planned for the subject effort. To implement the contract will require additional funds.

LM SIMPLIFICATION STUDIES FOR PROGRAM COST REDUCTION: The MDAC and GAEC Phase I study results are due January 13, 1969. It is planned to review these in-house and schedule a joint meeting with the contractors the following week to discuss the results and the requirement for beginning a Phase II effort.

WACS CONTROL COMPUTER DEFINITION & ELECTRONICS LOCATION MEETING: A meeting was held this week with the cognizant MSFC personnel to discuss the Workshop Attitude Control System (WACS) control computer definition and electronics location. It was agreed that the control computer will be analog and the primary electronics will be located on the Airlock Module. The required action to implement these decisions has been initiated.

AAP-2/MDAC CONTRACT DEFINITIZATION: The cost proposal on the Workshop, Airlock Module, Habitability Support Systems, and AAP-2 Systems Engineering is still on schedule and will be delivered to us January 17 or January 18.

LM CONTRACT DEFINITIZATION: Grumman is proceeding on our internal accelerated schedule towards a February 3 date for submitting their LM-A definitive proposal. Plans are underway to establish a combined MSFC team to review and assess this proposal in conjunction with the LM-A simplification studies noted above.

ATM CONTROL AND DISPLAY (C&D) BASELINE: We met with Martin/Bendix personnel on January 8-9, and reached agreement on the ATM C&D console scope of work, specification, and associated support documents. The discussions and agreements were in two phases: (1) to establish a technical basis compatible with the planned negotiations next week; and (2) to establish a baseline (effective January 9, 1969) from which we can enter into a configuration control mode.

ATM CRITICAL DESIGN REVIEWS (CDR'S): CDR's have been scheduled on all ATM systems hardware ("black boxes") to occur between now and early June, leading to the systems CDR in the first quarter of FY70.

Attachment re Baseline Meeting to Dr. von Braun, Mr. Weidner and General O'Connor only.

NOTES 1-13-69 BROWN

1/13 508

B 1/22

F-1 Engine - Reference my notes of 12-16-68 concerning fuel leakage from the overboard drain line of F-1 engine F-4024, position #1, S-IC-3. This leakage occurred after closing of the S-IC prevalves and was attributed in part to negative pressure induced during stage propellant drainage which caused movement of the #5 turbopump drain seal.

Rocketdyne and Boeing are investigating the incorporation of a drain procedure that would eliminate the negative pressure and/or seal movement which should in turn substantially reduce the possibility of fuel leakage during stage drainage at MTF and KSC.

J-2 Engine - Reference my notes of 1-6-69. S-II Battleship testing is in progress to determine specific propellant loading temperatures experienced by PU valve actuators. These data will be used to develop a special test program which will result in in-place testing of all flight PU valves. A meeting is currently scheduled for January 16 at MSFC to discuss necessary action for AS-504 PU systems.

Tests conducted by Rocketdyne simulating NPSH and engine mixture ratios experienced by S-II engines on AS-503 produced no unusual vibrations or LOX pump discharge pressure oscillations. (Reference my notes of 1-6-69.) Additional testing scheduled for January 15 will utilize a pulser to vary LOX pump inlet pressure in an effort to simulate oscillations recorded from the center engine of the S-II 503 stage.

NOTES 1/13/69 CONSTAN

1/13 9PA

B 1/18

Nothing of special significance.

NOTES 1-13-69 Downey

1/13 SCA

B 1/18

1. ASTRONOMY SUBCOMMITTEE MEETING: I attended a meeting of the Astronomy Subcommittee in Tucson last week. The primary business during the three-day meeting involved evaluation of proposals for the Pioneer F and G (Jupiter flyby missions) and the 1973 Mars lander mission. Also, a few miscellaneous experiment proposals were evaluated. One of these was an AAP proposal, "Maximum Sensitivity Detector to be Placed at the Focus of a NASA-Furnished Orbiting X-Ray Telescope," submitted by Boldt of Goddard. Boldt's proposal was approved by the Subcommittee and in the future will be considered in the ATM Follow-on studies being conducted by MSFC. I am very impressed by the current membership of the Astronomy Subcommittee. In general, the committee is a very conscientious and hard working group, and Dr. Roman does a competent job in running it. ✓

2. ATM CONTAMINATION TESTING: In preparation for the proposed contamination test in chamber "A" at MSC, concern has been expressed over possible cross contamination effects between S-13G white paint samples and 1st surface mirrors. If this were to occur, then it would be difficult to separate possible chamber contamination effects from S-13G outgassing effects. (S-13G is a thermal control paint which is proposed for use on the Workshop.) To check for this cross contamination effect, a series of tests is being run in our ion pumped vacuum system. Tests will be run in the near future with fresh samples of S-13G, with both P&VE and SSL performing measurements of degradation to permit comparative results. ✓

NOTES 1/13/69 GEISSLER

1/13 GS

B 1/18

1. AS-504 Sloshing Stability: Recent studies of AS-504 slosh stability, including bending slosh coupling terms in the analyses (whose effects had previously been evaluated for AS-501 as small), have uncovered a potential problem. These studies have shown that due to bending coupling, the S-IC fuel, the S-IC LOX, and the S-II LOX couple together to create a coupled slosh mode that is only marginally stable for low slosh wave amplitudes. Previous vehicles have shown similar coupling, but the effects of loading changes and the lighter S-II stage have caused the AS-504 to be less stable. This phenomenon is most severe just prior to the first gain switch at 105 seconds of flight. Effects of extreme parameter perturbations can cause this mode to be unstable such that the slosh wave will build up at a comparatively fast rate. Additional wave height, however, adds increased slosh damping thereby making the system less unstable. It is expected that a limit cycle of greater amplitude (roughly a factor of 3) than experienced on the AS-503 flight will occur. Since the values of increased slosh wave height, derived from a conservative rough estimate, create only small effects in the loads, engine angle, and g level in the crew compartment, it is felt that this is a problem to be cognizant of and to continue more detailed analyses, but it is not considered to be of sufficient consequences at this time to "red flag" AS-504 flight. ✓

LB James Your Comment is Invited B

2. Heat Shield Acoustic Environment at Launch and During Early IECO: Cracking and debonding of the M-31 heat shield material (in local areas) was noted during AS-503 and previous flights. It has been speculated that the combination of high acoustic and thermal environments could be a contributing factor. The AS-503 vibration measurement on the heat shield indicated extremely high launch values ($\gtrsim$ 80 g's rms overall). These levels are preliminary and further analyses will be performed. They decay rapidly after liftoff as expected and do not indicate any significant activity at IECO. Vibration measurements on the massive thrust structure (just forward of the heat shield) appear well behaved and repeatable for AS-501, 502 and 503 during the launch period. They were respectively 13.9, 13.4 and 14.8 g's rms (long.) overall. Therefore, the extremely high launch vibration environment, as noted by the AS-503 heat shield vibration measurement, was probably present on all three flights. External acoustic measurements from AS-501, 502 and 503 are also well behaved and repeatable and on the order of 170 db (Reference: 0.00002 N/m^2) overall during launch as expected for the heat shield region. This is an extremely high environment! The internal acoustic measurement above the heat shield on AS-503 is thought to have malfunctioned. Spectral information (50 - 3000 Hz) for the above noted measurements is not available at this time. Work is in progress to obtain these data. The apparent indications at this time are: 1. The dynamic loadings on the heat shield due to IECO appear to be insignificant. 2. The severe acoustic environment during launch creates extremely high dynamic loadings on the heat shield, and 3. The severe acoustic launch conditions combined with temperature effects and the continued inflight combined environmental effects on the heat shield could conceivably cause the debonding problem which has been noted. Additional work and more detailed analyses of the available vibration and acoustic data is underway with respect to this problem. ✓

NOTES 1-13-69 GRAU

1/13 9:05

B 1/18

1. MULTIPLE DOCKING ADAPTER (MDA): The MDA Structural Test Article arrived in building 4752 for alignment check December 24, 1968. Preliminary information revealed that the shell is within design requirements. On January 2, 1969, the MDA Structural Test Article was installed on the test stand in the pressure cell of building 4708. Thermolinear temperature sensors have been installed on the internal MDA "Christmas Tree"; temperature and Wiancko pressure heads have been installed and calibrated, and deflection measurement transducers have been installed and calibrated for both the bottom closure plate and shell circumferential deflections. Testing has progressed through the completion of all three docking tunnel proof and mass spectrometer leak checks. Only one tunnel exhibited excessive leakage. Details of this test will be transmitted to cognizant design personnel for disposition. Shell proof testing is now in progress.

2. IU PROGRAM: Ground Station validation is progressing satisfactorily for S-IU-507 checkout. Two new test program changes are being worked. From one a substantial reduction of ST-124 operating time during the measuring/noise test is expected. IBM is making the necessary changes to accomplish this. Secondly, a special test will be run to detect noise generated by the IU and transmitted on interface circuits to the spacecraft simulator.

NOTES 1/13/69 HAEUSSERMANN

P 1/18

1/13 OTS

1. Orbital Workshop Control System. During the last two months, intensive efforts have been underway to resolve the questions on the location of the OWS control electronics (IU or airlock) and whether the computer should be analog or digital. At a meeting last week within MSFC, the considerations of all the management and technical factors led to the decisions to locate the electronics in the airlock and to utilize an analog approach as outlined in my notes of 11/12/68. All concerned elements of R&DO and IO were in full agreement with these decisions.

2. ATM Procurement Actions. GE and IBM have been given letters authorizing them to incur precontract cost on the acceptance checkout equipment (ACE) and the ATM digital computer as of January 9, 1969 and January 7, 1969, respectively. Signed contracts for both companies are expected within two weeks. Finalization of these two contracts are the last major contracts required for the ATM program.

3. Facilities for ATM. Building 4656, formerly utilized by Test Lab, is being fully utilized for the ATM program. The clean room in the building will be modified to facilitate assembly, checkout and alignment of the Goddard X-ray telescope and cameras. The clean room is also being considered for receiving inspection of all the ATM experiments upon arrival at MSFC to supplement the ME Laboratory or Quality Laboratory clean rooms. Office space in the building is presently being utilized by some of our personnel and will house the Principal Investigators and their contractors at a time when the experiments are being integrated and checked out in the ATM.

4. Inhouse Fabrication for ATM. The present planning is for the Manufacturing Engineering Laboratory to fabricate the ATM charger/battery/regulator modules, electrical distributors, ESE and flight cabling and electrical checkout equipment. A review last week was held with the ME Lab personnel on this activity. The estimate of the manpower required for the fabrication of this ATM hardware and the manpower forecast for other ME Lab activities indicate that additional manpower must be provided. A survey is being made of other R&DO Labs' manpower capacity for electrical wiring. If such support is not available, off-site fabrication will be necessary.

B 1/10

NOTES 1-13-69 HEIMBURG

1/13 STS

1. POGO: Investigation of the AS-503 S-II anomaly is continuing in the following areas: (a) instrumentation validation, (b) structural data evaluation, (c) J-2 engine review. MSC has reported a peak amplitude of ± .1g in the longitudinal direction in the Command Module at 493 sec. A significant response at 17 to 18 cps frequency was seen in the center engine chamber pressure at approximately 480 seconds of flight. This is in the vicinity of the fifth vehicle mode where the crossbeam shows a large relative deflection. The crossbeam showed significant response due to this thrust perturbation. There was no significant 18 cps response in the spacecraft. The investigations to date have not determined the driving mechanism responsible for initiating the oscillations. Several possible sources are being investigated and engine tests are being conducted to duplicate the flight results. There will be a AS-503 S-II oscillation review to General Phillips (LDX) on January 16, 1969. The next POGO Working Group Meeting is scheduled for January 27, 1969.

2. McDONNELL DOUGLAS AIRCRAFT COMPANY (MDAC) CONTRACT DEFINITIZATION: Initial review of the MDAC/Eastern Division contract, scope of work and change packages, was conducted during the latter part of 1968. In preparation for the "Tiger Team" activities later this month, R&DO transmitted several mandatory items to be included in the proposal for negotiations. Only one was agreed to by the contractor - the preparation of a General Test Plan. Not included were items such as: (a) deletion of MDAC qualification philosophy (14 days demonstrated) rather than a philosophy keyed to mission duration, (b) stress corrosion survey, (c) hydrogen embrittlement materials survey, (d) flammability survey according to MSFC Specification 101, (e) review and approval of electrical networks according to MSFC drawing 40M39508C, (f) the requirement for a contractual instrumentation parts and components list, and (g) the inclusion of an internal acoustics test. We expect that MSFC will eventually include these items in the contract. Additional concern is related to our review for the waste and food management systems, since MSFC has not yet even seen the MDAC proposed design. The definitization of this contract will be given full attention.

3. BIOMEDICAL EXPERIMENTS: (a) On Friday, January 17, 1969, General Electric will demonstrate their USVMS (Urine Sample Volume Measuring System) in P&VE. Prior analysis of competitive systems indicates a high probability of success for this device in solving the USVMS problem. If the system is accepted by MSC Medical Directorate, it may provide the means of solving the MSC-MSFC waste management impasse. Appropriate parties from MSC and MSFC will attend. (b) A Preliminary Requirements Review (PRR) on Biomed Experiments will be held on January 30-31, 1969 at MSC. A Pre-Board PRR will be held on January 23-24, 1969. Our Task Team will be represented at the Pre-Board and the PRR at MSC.

4. LEM TRAINER FAILURE ANALYSIS: We have been informed by counterparts at MSC that the LEM trainer failure cause was initiated by an electronic failure in the control system rather than a structural failure. The specific cause of the failure has not been identified. Some time ago, we became involved in recommending inspection techniques for the trainer since the design of the landing system was fatigue sensitive. There is no indication that this system in any way triggered the failure.

NOTES 1-13-69 HOELZER
1/139Ts

B 1/18

Negative Report.

NOTES 1-13-69 JAMES

B 1/18

1/13 9A

1. S-IVB Flutter Kit: On Friday Gen. Phillips reviewed the recommendations of Langley, Boeing TIE, and MSFC regarding panel flutter on the S-IVB stage. Langley recommended that the S-IVB flutter kit be installed prior to any manned flights on the promise that we should not fly with known panel flutter. Boeing TIE recommended that we either install the flutter kit or increase the delta pressure across the panels by reducing the S-IVB forward skirt vent area. On the basis of the AEDC wind tunnel tests and flight experience I strongly recommended that we fly without further stage modifications. We were asked by George Hage to evaluate the possibility of reducing the vent area on AS-504 and subs but to do no further work towards adding the flutter kit.

2. S-II Stage Oscillations in Apollo 8: Expedited evaluation of the S-II Stage Oscillation anomaly observed in Apollo 8 is in progress. Although no significant conclusions have been drawn to date, the most likely candidate presently appears to be that a #5 engine LOX pump sensitive to 18 Hz is interacting with center beam vibration components. Other sources being considered include heat exchanger instability with structural coupling, and induced reaction from I. U. control signals. Evaluation to date has been sufficient to conclude absence of POGO during S-II-3 flight. Rocketdyne engine testing is in progress to support analysis.

3. Saturn V Platform Backup in Spacecraft: A letter was received from George Low, MSC, on Saturn Platform Backup stating that an automatic backup mode for S-IC Stage flight and a manual backup mode for S-II and S-IVB stage flight has been implemented in the spacecraft for the "F" Mission (AS-505). It requested MSFC to perform a thorough analysis of the above implementation mode on AS-505 and subsequent.

In subsequent discussions with R&DO of the spacecraft platform backup implementation for AS-505, it was concluded that the MSC mode implemented is the least desirable and the analysis required by MSFC to concur with its use was not compatible with the AS-505 schedule. After discussion with George Low and Chris Kraft, the following was agreed to: For AS-505, the launch vehicle will make the necessary hardware and software changes required to accomodate the spacecraft backup implementation; MSC will take the responsibility for any spacecraft takeover on AS-505 since the analysis required could not be performed for this launch; MSC and MSFC will further discuss and agree on an implementation mode for AS-506 and subs.

NOTES 1/13/69 JOHNSON

1/13 JS

B 1/18

AAP-2 Prime Experiments - On Monday, January 6, 1969, the MSFEB approved a revised listing of prime experiments for AAP-2. This list included four MSFC developed experiments: Contamination Measurements (T-027) being conducted by SSL under OART sponsorship; Gravity Substitute Workbench (M-507) being conducted by AERO and ME under OMSF sponsorship; and Tube Joining in Space (M-492) and Electron Beam Welding (M-493) being conducted by ME under OMSF sponsorship. The Committee also approved changes in the scope of the Tube Joining and the Electron Beam Welding experiments to permit utilization of the facility developed to conduct these experiments in space to also perform some space manufacturing experiments. Several experiments have been proposed involving metal casting, studies of foamed materials, the production of some composite materials, and studies of the Growth of Crystals in Zero "g" Environment. The experiments to be tried as a first step in the Zero "g" manufacturing (process) experiment program have not yet been selected. ME, P&VE and SSL are all involved in proposing and defining potential early experiments.

NOTES 1/13/69 MAUS

1/13/69

B 1/17

HUNTSVILLE CHAMBER OF COMMERCE COMMITTEE - We are preparing a briefing to be given on January 20, 1969 to a newly founded Committee of the Huntsville Chamber of Commerce chaired by Jimmy Record. This group wishes to contact other Chambers of Commerce around the country where NASA does business for the purpose of coordinating their efforts.

We are planning to give this group the latest information on:

1. Areas where NASA has installations and/or major contracts.
2. Congressional status, Committee assignments, etc.
3. NASA FY-70 budget and Program plans.
4. NASA Technology Utilization Program.

GODDARD CONVERSION OF SUPPORT CONTRACTORS TO CIVIL SERVICE - It has been proposed to and accepted by BOB, in the FY-70 Budget Submission, that Goddard be given authority to convert some 810 support contractors to civil service. The reason for the conversion is to comply with findings made by the Civil Service Commission involving the method of Government/Contractor supervision. This came out of the "Pellerzi decision" issued by the Civil Service Commission following the AFGE attack on NASA, challenging its widespread use of contract employees. In the FY-70 Budget Call letter issued by Bill Lilly's office, the permanent Civil Service Control data shown for Goddard were:

FY-68	FY-69	FY-70
3822	4243	4412

The difference between FY-68 and FY-70 is 590 which should be the net effect (taking the attrition tax into account) of the support contractor conversion which is to take place over the next eighteen months.

According to Hqs. personnel, the Bureau of Budget has told NASA, in effect, that "We are helping you get out of the undesirable support contractor situation at Goddard, but this should not be anticipated to solve other similiar situations."

NOTES 1/13/69 MOHLERE

1/13 9PS

B 1/18

Negative report.

NOTES 1/13/69 MURPHY

1/13/69

B 1/18

S-II Procedures Review (MTF):

S-II procedures currently used by North American Rockwell at Mississippi Test Facility for inerting the facility and stage LH_2 systems were reviewed by this Office. It was determined that sufficient requirements are provided to obtain and keep the LH_2 systems inerted prior to initiating hydrogen flow provided the procedures are followed. The Program Office has been apprised of the review findings and release was given to Mississippi Test Facility on January 10, 1969.

S-II Mini-B Test Stage Investigation:

A parallel MSFC/NAR investigation is continuing on the S-II Mini-B stage accident. Dr. Mrazek's Committee will have final report available on 20 January. The NAR Committee is chaired by Mr. Bill Parker. Their final report is to be available on 15 January. At that time the MSFC Committee will meet with NAR to evaluate the report and resolve any incompatabilities. KSC, MSC, MTF and Michoud will be asked to attend this and other meetings as it concerns the findings of the investigating committees. Additionally, our Program Offices will inform their contractors of all pertinent findings.

Safety Training:

A Fire Safety Training Course will be conducted here January 13 - 16, 1969. Headquarters Safety and Fire Protection Engineers together with our Fire Protection Specialist will present a variety of fire safety topics. This course will be video taped for use throughout NASA. Employees assigned as building or area fire marshals, unit safety coordinators, and facility engineers are representative of those attending.

A National Safety Council Defensive Driving Training Course is also planned for January 13 and 14, 1969. This initial course will be taught by State of Alabama certified instructors and will be attended by persons employed at MSFC as drivers (both civil service and contractors). Employees completing this course will be candidate instructors who, in turn, will be used to teach follow-on Defensive Driving Training to our employees and contractors.

B 1/18

NOTES 1/13/69 RICHARD
1/13 9A

AAP WACS Control Computer: At a Center meeting last Thursday, it was decided to use an analog computer for the WACS and to locate the WACS electronics in the Airlock Module. The decision to go analog rather than digital and to put the electronics in the Airlock Module rather than the IU will limit IBM participation in the AAP activities to the point where you might expect to receive an IBM visit for the purpose of discussing this decision.

AAP Cluster Requirements Specification Status: The Cluster Requirements Specification is in a review cycle at MSFC and with Headquarters, KSC, and MSC. We expect this specification to be published in final form next month. You may recall that the Cluster Requirements Specification is backed up by eight Systems Criteria Documents which are Attitude Control, Electrical Power, Display and Control, Instrumentation and Communication, Crew Systems, Environmental Control, Passivation, and Structural. All of these criteria documents require inter-center review; however, we expect to have them published in final form in March of this year.

Propellant Loading Sequence for AS-504: The propellant loading sequence for AS-504 has been changed to stop cryogenic topping at T-186 seconds for all stages. This change will remove approximately nine interlocks from the sequence that could give cutoff. From past loading data it appears that the flight mass will be within the $\pm 0.2\%$ tolerance. The flight mass will be monitored as a redline value. P&VE will provide personnel to support KSC during CDDT and launch to verify if any additional propellant will be required. P&VE will reflect this new sequence in their propellant loading tables for AS-505. This change will eliminate the requirement for an earlier swing time for swing arm #1 which was slow in retracting for AS-503. From test data, it appears that excessive pressure in the fill line tended to impede the retraction and swinging of the arm. The first change mentioned will provide an additional 42 seconds of purging to insure against the presence of liquid in the line and prohibit excessive pressure buildup.

NOTES 1/13/69 SPEER

1/13 JSA

B 1/18

NEGATIVE REPORT.

NOTES 1-13-69 SIEBEL

B 1/18

1/13 9:15

1. ATM Cameras: The second ATM Camera built by R-ME was delivered to ASTR on January 3. This is the engineering model for the H-Alpha experiment.

2. Vendor Assessment for Apollo: Our Industrial Support Branch, whose main function is the technical monitoring of procurement contracts for flight hardware components and special tooling, also participates in vendor assessment activities with R-QUAL when manufacturing problems arise. Recent activities have included a review of the techniques of wiring and assembling the LM descent engine electronic components; for example, electrical junction boxes and harnesses. During this vendor assessment, some unsatisfactory manufacturing methods were reported. ME liaison people are stationed at the West Coast and at Grumman. They are now working with the contractor in question as well as with Grumman to ensure the greatest reliability in the electrical components produced.

3. R&D Projects: R-QUAL and R-ME have made arrangements for presentation to each other on their in-house R&D projects. This review will take place periodically and is intended further to improve the cooperation between the laboratories and to reduce duplication of effort. R-QUAL, for example, will be able to develop inspection and evaluation methods as we work on new or modified manufacturing processes. We, on the other hand, will become better aware of new inspection methods and will be able thereby to enhance the quality of the manufacturing processes and of workmanship.

4. Manufacturing Support to Apollo: The ME liaison people stationed at Apollo/Downey have recently worked with W. H. Gray (NASA/RASPO/Downey) and with the R-QUAL representative to resolve some electrical manufacturing problems at the NAR McAlister Plant which produces electronic components for the ~~SCM~~ CSM.

5. Personnel: Neil Martin, the Chief of our Tool Design and Engineering Branch, resigned this week. This is particularly unfortunate at this time because his long experience will not be available for the extensive tooling program in which we are engaged for ATM, MDA, Payload Shroud, etc.

B 1/12

NOTES 1-13-69 Stuhlinger

1/13 9:45

1. SCIENTIFIC ACCOMPLISHMENTS IN SCIENCE, GSFC, 1968: A one-day symposium on this subject at GSFC on 1/10 was attended by 10 members of MSFC. Hosted by Dr. J. F. Clark and chaired by Dr. G. F. Pieper, the symposium produced 42 five-minute presentations on such subjects as atmospheric physics, planetary physics, solar physics, solar wind, X-ray astronomy, gamma ray astronomy, IR and radio astronomy. In spite of the brevity of the presentations, the symposium was excellent as far as information content, scientific quality, stimulating power, and organization are concerned. Dr. Clark, in his introduction, said that the presentations are "typical, but by no means all-inclusive" of the scientific work at GSFC.

Most of the speakers had Ph. D. degrees and were in the 25-40 year age bracket. Each speaker presented his own scientific work, and not the work of a contractor which he had supervised. All the speakers conveyed the impression of being in continuous contact with the experts in the scientific world outside NASA, and of being respected by outside scientists as true colleagues. Dr. Pieper, Assistant Director for Space Sciences, explained: "Once we are sure that a man is a capable, sincere, and productive scientist who wants to work in a field that belongs to GSFC's area of interest, we exercise very little supervision. He is responsible for his own work. We let him know that he is an important member of the Center as long as he lives up to the standards of good scientific work; and we make sure that he obtains sufficient support with respect to technical, engineering, and administrative assistance, and that he has the opportunity of interacting freely with outside scientists. It looks like this method produces good results."

Agree! B

2. OAO-II SATELLITE: The astronomy satellite OAO-II, launched on December 7, 1968, is in excellent working condition. With the exception of one of four Uvicon tubes (SAO experiment), which has suffered somewhat from oversensitivity to solar Lyman alpha radiation and consequently lost part of its capability, all instruments and components are working very well. Stabilization has been accomplished almost completely by using the magnetic moment for momentum dump; the gas momentum dump system has not been needed so far to any significant extent. There have been no signs of optical contamination as yet. An operating lifetime of several years is presently predicted for OAO-II.

The ground control station for OAO-II at GSFC gives the impression of a very well-working, well-designed routine operation.

The excellent success of the OAO-II flight will have a strong influence on the further program of unmanned astronomy satellites. Information on astronomical results from the OAO-II flight will probably be published for the first time at the April meeting of the American Astronomical Society.

B 1/18

NOTES 1/13/69 TESSMANN

1/13 9:15

F-1 ENGINE: Test FW-105 with engine S/N F-2009-1 was conducted on 1/9/69. Test FW-106 is scheduled 1/15/69. (See Notes 1/6/69)

S-II-7 (MTF): Two vibration measurements are being installed on the center engine lox inlet duct to determine natural frequency as related to the 503 S-II engine No. 5 chugging phenomenon.

S-IVB BATTLESHIP (MSFC): A Cryogenic acceptance test was performed on the lox tank pressurization module S/N 48, for use on S-IVB-504. The module operated satisfactorily at -300° F body temperature after cold helium blowdown from 3000 psi to 1000 psi. A successful 410 seconds duration static firing was performed following the module test to simulate S-II-503 center engine Pc oscillation conditions. The engine was operated at 4.4 mixture ratio, gimbaled at various frequencies and the lox pump inlet pressure was between 17-20 psig. Under 503 simulated conditions, we saw no indications of chugging or sustained oscillations. However, near the end of the firing under a no gimbal condition with a 5.0 mixture ratio and 19 psig lox pump inlet pressure, a sustained 18 cps oscillation in lox pump inlet pressure was observed.

ORBITAL WORKSHOP INSULATION: The first test of the OWS Insulation Outgassing Test Program was conducted on 1/8 and 1/9/69. This test program was conducted in the 15' vacuum chamber located in the SAT-1/1B Dynamic Test Stand. An 8-foot diameter test tank internally insulated with OWS insulation and foil liner was used as the test article. Purpose of test is to provide data to assure that the outgassing characteristics of the Orbital Workshop Insulation system is compatible with the overall design. A nine day test is scheduled for the week of January 13, 1969.

NOTES - WILLIAMS - 1/13/69

1/13 9?3

B 1/18

1. PX-15 Project: Headquarters has provided us with $100K from Saturn funds, and we anticipate having a contract by Feb. 1. Chet May spent 3 days (Jan. 3 - 9) with Grumman at West Palm Beach defining tasks to be accomplished through Jan. 22. At that time another meeting will be held to define the remaining aspects of the project. Chet will be in West Palm Beach Jan. 13 - 24. From Jan. 13 - 17 he will be getting certified in Scuba, and Jan. 20 - 22 he will be on the surface ship monitoring one-day dives of the PX-15 in the open ocean.

2. Lunar Roving Vehicle (LRV): Proposals were received from Grumman, General Motors, and Bendix in response to MSFC's RFP for a Phase B study on the LRV. The technical evaluation will be accomplished here the week of Jan. 20. ✓

3. B_O Study: The Advanced Spacecraft Technology Division of MSC has requested a briefing on the results of our Bo study. They are about to work the problem of a Saturn V dry workshop in lieu of the present AAP Core. The study will apparently be done in that division of MSC and is not condoned by John Hodge or Bob Thompson. ✓

Jan 20, 1969

SATURN V PROGRAM MANAGER

MEMORANDUM

TO: SHEPHERD

SUBJECT: DIR

In case it is discussed up there Hal Becker heads MSFC effort. Apparently the boss missed this point

LS

2/20/69

File as satisfactorily resolved

2/24

RECEIVED
FEB 20 1969
DIR

2465

I-V-MGR

NOTE TO : Dr. von Braun, DIR January 31, 1969

FROM : Manager, Saturn V Program, I-V-MGR

SUBJECT : Post Apollo lunar landing missions (Stoney Study)

REFERENCE: Your comment on my notes of 1/20/69 (attached)

The initial meetings at MSC on January 21-22 defined Apollo missions beyond the early lunar landings and involved missions through vehicle 515. Bill Lucas' representative was unable to attend the initial meetings; however, Mr. Hal Becker was appointed to head the MSFC team in the review conducted at MSC during the second week. A review of the findings is scheduled for you by Mr. Becker on Monday, February 3, 1969, in preparation for the review at the Executive Session of the Management Council Meeting.

Saturn V will continue to participate in this activity as it affects our planning.

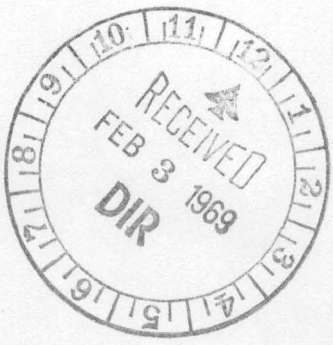
But so should Bill Lucas, as it also affects total Center commitments! B

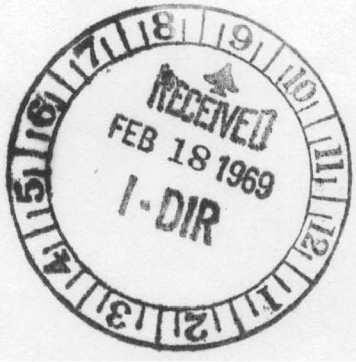
Lee B. James

1 Enclosure:
As stated

cc: Dr. Lucas (get a separate copy) BL 2/19

Lee - I don't think this need any more notes. I conclude that VB missed our intentions but am sure Lucas has lead and understands so. 19 Feb





OFFICE OF DIRECTOR – MSFC

CODE	NAME	INIT.	☐ ACTION	☐ INFORMATION
DIR	Dr. von Braun			

REMARKS

Re your question on Williams NOTES - 1/20/69, Mr. Williams said all sessions start at 9 a.m. in the tenth floor conference room and should end around noon.

He said the most important ones would be January 30 (General Dynamics) and January 31 (Lockheed) because we will be receiving very shortly a letter from Dr. Mueller saying these two will be our contractors. He said you have already heard the Lockheed "Star Clipper" presentation however.

In declining order, the others would be:

January 29 McDonnell-Douglas
January 24 - North American - Rockwell
January 23 - Martin-Marietta

Molly - 1/22/69

CODE	NAME	DATE

MSFC - Form 495 (Rev August 1963)

B 1/21

NOTES/1-20-69/BALCH

S-II-6 - Stage is still in the Vertical Checkout Building. All modifications are expected to be completed by 1/21/69, and removal from the Vertical Checkout Building is planned 1/23/69. Stage is still expected to be ready to ship to KSC on 1/25/69.

S-II-7 - Cryogenic proof pressure test was successfully accomplished on 1/15/69. Static firing has been rescheduled from 1/21/69 to 1/22/69 because of instrumentation changes required to investigate AS-503 flight anomalies.

S-IC-9 - Stage is in the B-2 position of the S-I-C Test Stand undergoing pre-static checkout and modifications. "Power-up" and static firing are still planned for 1/29/69 and 2/19/6 respectively.

BOMEX - We are delivering the first Signal Conditioning and Recording Device (SCARD) almost two months early to Port Everglades, Florida on 1/24/69 for installation on the ship "Discoverer", which will leave Miami on 1/28/69 to participate in the Atlantic Tradewind Experiment (ATEX).

MTF participated in a BOMEX status review on 1/16/69 to Dr. White, ESSA Administrator, his deputy, Dr. Townsend, and the new BOMEX Scientific Director, Dr. Kuettner. Dr. White extended his appreciation to NASA MSFC for the work we have done on behalf of this program.

We are now deep enough in this program to have a first hand appreciation for most of the problems, scientific and technological goals, and the areas of needed improvements for oceanography/meteorology for future programs. We are also learning how to work in harmony with other agencies. An interesting status report on this subject can be provided to you.

J.B. Good approach B

The NASA BOMEX Advisory Committee which consists of several Centers under OSSA leadership now plans to visit MTF on 2/19/69 and 2/20/69 to review our work.

INSTALLATION:

University Research - Major emphasis at present is on defining and outlining the support activities that will be rendered to LSU under their NASA Research Grant, Office of University Affairs, NASA Headquarters.

NOTES 1/20/69 BELEW B 1/21

ITT LASER RENDEZVOUS/DOCKING SYSTEM: A meeting to discuss the feasibility of the ITT Laser Rendezvous/Docking System for AAP-2 and AAP-4 flights will be held on January 31, with systems, labs, and projects represented. MSC and NASA Headquarters (Phil Culbertson) have received recent presentations by ITT and have expressed substantial interest. ✓

HABITABILITY SUPPORT SYSTEM REQUIREMENTS: By telecon with MSC (Reg Machell) on January 15, we received word that the MSFC prepared Habitability Support System (HSS) Performance Requirements had received a gross review by MSC and was found to be generally acceptable. MSC suggests we proceed as planned with the HSS Preliminary Requirements Review. The PRR data package will be received on February 14, and the PRR will be held on March 5-6. Trade studies and design concepts should be available at this time. MSC will plan on making their major input at the PRR. MSC (lower echelons) is now in agreement that MSFC will furnish the total Waste Management System including the waste collection devices. ✓

AAP-2/MDAC CONTRACT DEFINITIZATION: Cost proposals from the McDonnell Douglas Astronautics Company (MDAC) on the Saturn I Workshop, Airlock Module, AAP-2 Systems Engineering, and the Habitability Support Systems were received on schedule January 17. They have been distributed for evaluation and technical evaluation is scheduled for completion January 31. ✓

APOLLO LM HARDWARE ALLOCATION TO AAP: Headquarters' directives plan to definitely allocate LM-15 and LM-2 to AAP. The suitability of LM-2 for a flight item has been questioned by MSC and MSFC because it is not a "lightweight" LM, is not identical to LM-15, and will have undergone drop tests as part of the Apollo LM qualification. We feel that the Apollo LM organization will reassess LM hardware availability after the LM flight in February. ✓

MARTIN CONTRACT DEFINITIZATION: Progress toward definitization of the Martin Contract is as follows: Approval of MSFC's prenegotiation position was received from Headquarters January 16, 1969. The week's delay in approval centered around the "provisioning" clause which would allow the later inclusion of work in the Martin Contract in support of AAP Flights 5, 6, 7, and 8. MSFC and Headquarters are now in agreement on the clause. This clause is broadly worded to permit management decision with regard to possible Saturn V flight work to be made later. ✓

NOTES 1-20-69 BROWN B 1/21

GENERAL - On January 16, an Engine Flight Readiness Assessment for AS-504 was held with Rocketdyne at MSFC. Generally speaking, the engines are in good shape for the launch. Validation testing of the J-2 Propellant Utilization valves and S-II center engine oscillations are the most significant unresolved problems. During the Assessment, Rocketdyne recommended certain changes in the flight mission rules (J-2 restart in particular) which were deliberated at length. These will be given further consideration by the respective MSFC offices.

F-1 ENGINE - During routine surveillance of the engines on S-IC-8 at MAF, the engine in position 104 (engine 6059) was found to have an audible leak in the primary LOX pump seal at 1-1/2 psi standby pressure. Testing, including pressurization up to 10 psi and rotation of pump, indicated erratic sealing. Consequently, we have requested that replacement of the seal be scheduled. Further investigation of the technical aspects is continuing.

J-2 ENGINE - As you heard at the Center Staff and Board Meeting last Friday, the J-2 engine oscillations on S-II 503 have not been fully explained and detailed studies by Science and Engineering Directorate, NAR/Space Division and Rocketdyne are continuing. Various combinations of P.U. valve position, NPSH, propellant quality and structural response are being investigated. However, present schedules for the supporting testing are tight with respect to AS-504 launch. In the LDX with General Phillips on January 17, January 31 was set as the date for establishing necessary actions for AS-504.

Bill B.
Could this still become a show-stopper for Apollo 9?
B

NOTES/CONSTAN/1-20-69

B 1/21

Nothing of significance to report.

B 1/21

NOTES 1-20-69 Downey

1. OSSA SUPPORT: The Center recently received additional FY-69 program authority from OSSA for a number of tasks covering experiments and other effort associated with the planning of ATM Follow-on payloads. Although the total funding involved was not large (457K), it is very significant since we are beginning to get a larger share of OSSA's experiment definition effort. OSSA is also providing support for SSL's balloon flight program. Four balloons have already been approved and scheduled (CY 69) by OSSA for flights of our gamma-ray spectroscopy and neutron albedo experiments, both of which are joint MSFC-ORNL (Oak Ridge National Laboratory) experiments.

2. APOLLO LUNAR SURFACE EXPERIMENT: Dr. Costes was asked by Dr. E. M. Shoemaker, Principal Investigator of the Apollo Lunar Geology Experiment, to join his team as a Co-investigator. On January 10 Dr. Costes gave a presentation to the Lunar Surface Operations Planning Working Group (LSOP) in Houston on soil mechanics investigations that can be performed during the first Apollo landing. It is our understanding that Dr. Costes will serve as the cognizant scientist on these investigations which have already been approved by the MSFEB, with Dr. W. D. Carrier of MSC and Prof. J. K. Mitchell of the University of California, Berkeley, as Co-investigators. Dr. Costes is accompanying Dr. Bill Johnson to MSC (January 21-22) to discuss planning of the Apollo lunar surface science for missions after the first mission.

3. VISIT BY DR. KURZWEG: Dr. Kurzweg of OART visited MSFC to obtain information on our research effort, particularly the areas which are supported by his program. His visit was hosted by R-EO. We felt that the presentations which we made to him were well received and that he is well impressed with our efforts.

4. UAH RESEARCH INSTITUTE: SSL has initiated action to develop an improved program of mutual support with the UAH Research Institute. Dr. Rudolf Hermann, Mr. William Watts and Dr. K. Thompson visited SSL on January 17 to hear presentations on a number (12) of our scientific programs. Dr. Hermann indicated the RI had a capability to support about ten. Meetings are presently being arranged for detailed discussions, development of scopes of work and funding estimates. Hopefully these efforts can be supported by either our Experiments Office or University Affairs Office.

NOTES 1/20/69 GEISSLER

B 1/21

1. S-IVB Controlled Reentry: A very brief feasibility study was performed on the possibility of controlling the earth reentry of the S-IVB stage from a 100 n. mi orbit. This was requested by Mr. Godfrey in order to consider the possibility of disposing of the S-IVB stage if the CSM separates in earth orbit. P&VE had requested that the capability be provided to get a contingency burn to escape, if the CSM had to separate in earth orbit. Preliminary results indicate controlled earth reentry into an ocean area could be provided, to minimize hazards of orbital debris by burning the S-IVB stage in a retro attitude. The sequence would be initiated by ground command. The Saturn V program office will decide if future studies are warranted.

2. Meeting on Wind Loads on Buildings and Tall Structures: Subject meeting was arranged by the National Bureau of Standards and the ESSA-Environmental Data Service for January 27 and 28. Mr. Kaufman and Mr. Fichtl, of our Aerospace Environmental Division, will give an invited talk on their work to define the characteristics and lower atmospheric turbulence as related to wind loads on tall structures. Major topic areas for this invitational meeting are as follows: a. Engineering problems in the design of structures to resist wind loads; b. Atmospheric conditions; c. Experimental and theoretical determination of aerodynamic forces; and d. Recent advances in design procedures and current deficiencies. Due to our Aerospace Environment Division's cooperation on several studies with the two sponsoring groups, they are paying our travel expenses associated with this meeting. 45 people are expected to attend.

3. S-IC Heat Shield: The early cut-off of the center engine in the S-IC stage has no significant adverse thermal effects on the heat shield except for the slightly longer time of exposure. The predicted environment for this condition had been documented and the heating rates derived from scaled tests as well as flight results indicate only minor local changes in the heating rates at the base. Some were higher, some a little lower. The spread was, however, only 2 BTU/ft^2/sec which is within the band of confidence in these data. If the heat shield remains intact mechanically, it will easily withstand the slightly longer burning time. It is known, however, that bits of M-31 insulation have come off as early as 60 seconds after lift off. This has led to occasional hot spots in the honeycomb substructure as telemetered records show. Since the M-31 insulation degradation begins to occur at about half time of the S-IC burn and since the phenomenon itself is erratic and unpredictable, the slightly longer burn time because of early center engine cut-off is only a secondary perturbation to the basic problem. The question which should be answered now is: "Does the heat shield construction need to be improved to avoid the loss of M-31 as now experienced?"

NOTES 1-20-69 GRAU

B 1/4

SATURN V DAMPING RETRACT AND RECONNECT SYSTEM (DRRS) TEST PROGRAM:
In the second quarter of 1966 this Laboratory accepted the responsibility of performing qualification testing on the Saturn V DRRS. An increase in the number of components to be qualified, delayed component delivery schedules, and additional testing on reworked and redesigned components substantially enlarged the task as it was originally conceived. The program required that we establish a hydraulic flow capability in our environmental test facility. This was accomplished by a search of other MSFC organizations for idle pumps and consoles which we borrowed and installed in the facility. All testing was recently completed at a total expenditure of approximately 30,000 manhours for testing, facility modification, and design of test setups. Approximately $53,000 was required for fabrication of test fixtures and equipment. Forty-three anomalies occurred during the course of testing; a number of these resulting from the fact that off-the-shelf hardware was procured and normal government quality control was not imposed. Resolution of anomalies resulted in one component being discarded and replaced by a new design, four components being redesigned, and two components being reworked to proper configuration. The always prompt attention of the P&VE Laboratory to the test anomalies and their resolution is gratefully acknowledged.

B 1/21

NOTES 1/20/69 HAEUSSERMANN

1. ATM Rack Layout. An updated baseline of the layout of the electronic/electrical components on the ATM rack was established last week. This layout for the first time satisfies all known considerations as to number of components and their requirements, such as the thermal requirements, cable routing and those electronic components which are sensitive to interconnecting cabling lengths. With respect to the predocking thermal requirements, analysis can now proceed and is based on a defined attitude profile and timeline which has been established between MSC and MSFC. ✓

2. ATM Solar Array Deployment. Consideration has been given to providing a manual crank to deploy the solar array in the event of a failed actuator mechanism. Since the array is spring loaded due to the deployment springs and the electrical cable, a safety hazard would exist for any astronaut in the vicinity of the nondeployed array. Based on this condition, the design is proceeding without any manual crank capability. The capability to reverse the deployment motor drive has been added to the control and display console. This capability would only be used in the event the scissor mechanism became stuck and a reversal/forward cycling could allow the mechanism to work free. We are confident of successful deployment without manual backup. ✓

B 1/21

NOTES 1-20-69 HEIMBURG

1. J-2S ALTITUDE TESTING AT AEDC: A 288-second J-2S idle mode test was conducted at AEDC on 1-10-69. Data during the run showed pressure spikes in the chamber LOX injection, and fuel injection pressures commencing at 150 seconds into the run until cutoff. Post test inspection revealed extensive hardware damage in the area of the chamber tubes and injector face. Failure theories are premature at this writing as data analysis is incomplete. The engine is scheduled to be removed from the altitude cell and returned to Rocketdyne for tear down and inspection. ✓

2. VISIT BY REPRESENTATIVES OF THE NATIONAL COMMUNICABLE DISEASE CENTER (NCDC): Last fall, informal discussions with the NCDC were initiated between Dr. John R. Bagby, Deputy Director of NCDC, and the MSFC originator (G. Keller of R-P&VE) of a prospective microbiological experiment (change of pathogenic bacteria as a function of 0-g or prolonged 0-g). Dr. Bagby visited MSFC (including Dr. Stuhlinger) 1-15-69 for further discussions of the experiment, which is being considered favorably by the NCDC technical personnel. He was joined by Dr. R. Q. Robinson, Director of NCDC Laboratory Division, and Dr. V. R. Dowell, Research Microbiologist in charge of Anaerobic Bacterial Laboratory. Mr. Keller's basic ideas will be implemented by NCDC in the role of principal investigator, subject to evaluation of resource availabilities and priorities. Dr. Bagby intends to discuss the experiment with Dr. Paine and Dr. Mueller during a luncheon presently arranged within this month. ✓

3. PAYLOAD SHROUD: Mr. Schneider, Director of AAP, baselined the MSFC 203 type nosecone and cylindrical section (Saturn Payload Shroud) for use on unmanned AAP flights. Mr. Schneider requested that a PDR be held no later than 5-1-69. The preliminary R&D Plan has been formally transmitted to Mr. Belew. A Configuration Review for I-S/AA was held 1-17-69, culminating in the release of drawings for the fabrication of the test item. ✓

4. POGO: Our tentative conclusions concerning the experienced S-II stage oscillations are: Engine #5 performance shift is probably a result of high amplitude 18 Hz oscillation; 18 Hz oscillation is an engine generated phenomenon probably amplified by a structural interaction during flight. Probable contributing factors are: Lox tank level, NPSH, Engine mixture ratio. All outboard engines operated as expected. The structural response levels on the AS-503 flight do not impact the structural integrity of AS-504. ✓

K.H. No hardware changes required? B

5. S-IVB BATTLESHIP TESTS: 18 Hz oscillations were successfully self induced in LOX pump discharge pressure at inlet pressures simulating those incurred during AS-503 flight. ✓ The engine was pulsed by gimbaling during periods of self induced oscillations. Data is presently under evaluation to determine the effects of inlet pressure pulsing during periods of self induced oscillations. The influence of NPSH and engine mixture ratio upon the incidence of self induced oscillations will also be determined. ✓

6. PROFESSIONAL MEMBERSHIP: Dr. Robert E. Allen from our Human Factors Engineering Section has recently been accepted as a member of the Aerospace Medical Association. The association is a professional organization composed of medical specialists and life scientists in the field of aerospace medicine. ✓

NOTES 1-20-69 HOELZER

B 1/21

DEMONSTRATION OF SATURN-BREADBOARD SOFTWARE SIMULATOR:

A demonstration of the Saturn-Breadboard Simulator with the data base of the Saturn V Instrument Unit was given jointly by the Astrionics Laboratory and the Computer Systems Analysis Branch of the Computation Laboratory to Mr. Kroeger, Mr. Fichtner, R-ASTR; Dr. Hoelzer, Mr. Prince, R-COMP, and others. The Breadboard Simulator is a new approach for the checkout of Launch Computer programs (two RCA 110A); a digital computer (SDS 930) simulates discrete, analog and Digital Data Acquisition System (DDAS) functions of the launch vehicle and its GSE and responds in real-time to the signals of the launch computers as is presently done by the more expensive hardware breadboard. This software simulator has great potential. It is more flexible and can be used for the simulation of systems other than Saturn configurations. If the hardware to be tested is changed, only the data base consisting of time-dependent logical and algebraic equations has to be changed. For analyzing the system under test, failures can be easily introduced without endangering actual equipment.

NOTES 1-20-69 JAMES

B 1/21

LBJ

Suggest you get in touch with Bill Lucas and send me a joint statement how this will be handled. Obviously, Bill in his new role is deeply involved in this

B

1. Apollo Mission Planning: I received a phone call from Sam Phillips' office last week establishing a review of the mainstream Apollo lunar landing missions. We have coordinated participation with center organizations for a meeting on January 21 and 22 at MSC. ✓

2. S-IVB Flutter Kit: Sam Phillips' TWX, January 14, requested the MSFC position on reducing the S-IVB-504 forward skirt vent area. This, as you recall from my note last week, is an alternative to installation of the Flutter Kit which Headquarters is no longer asking be installed. We have agreed to present to the Management Council a discussion on vent areas and sublimators. ✓

3. Revised Propellant Loading Effects on S-IC: As noted in Ludie Richard's note of January 13, 1969, cryogenic topping will cease on all stages at T-186 seconds. This simplifies the final automatic sequence and should improve marginal Swingarm #1 timing. The S-IC Lox boiloff during automatic sequence may approach the tolerance and require a verification test during CDDT. Investigations and analysis are continuing with P&VE and Boeing. ✓

4. Cork Insulation for S-II Stages: Testing has been underway for several months to qualify a cork application for localized "hot spots" in protuberance areas on the spray foamed S-II stages. The X-15 testing conducted last year indicated that spray foam insulation would erode badly in localized areas around ramp areas and fairings without additional protection. North American plans to proceed with a combined honeycomb insert covered with cork on hot spot areas on S-II-8. This will delay S-II-8 shipment to MTF but should not affect delivery to KSC. ✓

5. Acoustic Measurements for S-IC-5: The external acoustic measurements requested by Dr. Geissler to study the external low pressure fluctuations in the tank area during S-IC burn may have to be dropped due to hardware delivery problems. Action has been underway for several weeks by Boeing, Astrionics, and Aero-Astrodynamics Labs to work around the hardware and design problems to complete this installation prior to rollout of S-IC-5. Since this is the last S-IC stage with R&D telmetry, a final attempt is being made to work out the problems. ✓

6. AS-505: The possibility of using AS-505 as a backup for the AS-504 mission, with a consequent earlier launch, is under study. This could cause us major software delivery problems. ✓

NOTES 1/20/69 JOHNSON

B 1/21

OART Withdrawal of FY-68 funds - We talked with Paul Cotton, Programs and Resources Division Director, OART, Friday about the proposed withdrawal of unobligated FY-68 OART funds. He confirmed their plans to withdraw all unobligated funds on a case by case basis if our procurement has not advanced sufficiently to involve the contractor and the Center in a proposal evaluation phase. He would not give a specific reason for the action, but implied that it was simply a bookkeeping (clean-up) operation. This would help define exactly where the FY-68 resources have been applied thereby enabling us to concentrate on planning the final implementation of the FY-69 program and initiate planning of the FY-70 program. He said there is no threat at this time of our uncommitted or unobligated FY-69 funds being withdrawn. We believe, however, it would be prudent for us to anticipate such an action. We are working with the Labs and the Purchasing Office to move the procurements as rapidly as possible. ✓

Visit by Dr. Kurzweg, Director of Research Division of OART - Dr. Kurzweg and three of his staff and one mathematician consultant visited our Center January 14-16 for a routine review of his program area at MSFC. He was briefed by AERO-ASTRO, P&VE (Materials Division), COMP and ME Labs. I believe he was duly impressed with our interest in research and by our capabilities. ✓

NOTES 1/20/69 MAUS

B 1/21

CHRYSLER'S NATIONAL SPACE BOOSTER STUDY:

The draft report of the Saturn data has been reviewed by MSFC, KSC and MSF. The final report is to be submitted by Chrysler by February 15.

As you know Saturn IB/Titan III analysis by Chrysler is in process. Representatives of this office visited Chrysler last week to review study progress and have the following comments:

Chrysler's data indicates the cost of a Saturn IB, through launch, (at a 4 X 4 rate) as $68.1M average. The Titan IIIM average unit cost, through launch, was $18.2M average at a four per year rate. However, Chrysler in this study identified certain activities in Saturn IB which were excluded in the Titan IIIM cost.

When these exceptions were excluded from the IB cost the Saturn IB through launch cost was reduced to $41.6M average.

There are undoubtedly more exclusions than Chrysler was able to identify and/or quantify due to meager communications lines between the Air Force and their contractors.

Chrysler is to submit a draft report of the Saturn/Titan analysis on February 15. This report will not be a volume of the NSBS*report but an addendum with very limited distribution. The report will not be a "comparison" between Saturn IB/Titan but rather a report of the costing methods.

*National Space Booster Study

H.M. → Gladeus that means, I'm afraid these findings spell doom for the IB

B 1/21

B 1/21

NOTES 1/20/69 MURPHY

Lunar Landing Training Vehicle (LLTV) Accident Investigation:

Preliminary findings indicate that the accident was not caused by a hardware problem and is an aero-dynamics problem. To provide further analysis, MSC has shipped LLTV #2 (LLTV #1 crashed) to Langley for full-scale open throat wind tunnel testing. Langley is running a low speed subsonic tunnel test, and the earliest analysis is to be available approximately February 8, 1969.

We will keep you informed as further information becomes available. ✓

Ernst Stuhlinger

FYI B

B 1/24

NOTES 1/20/69 RICHARD

LM Simplification Studies: As anticipated results of the Grumman study of possible reductions in LM costs through simplification indicate that only minimal savings are possible unless mission requirements are reduced. For example, no extensive thermal system reductions are possible as long as EVA is conducted from the LM and as long as the remote TV and other heat producing nice-to-have features of the ATM control and display panel are retained. (The C&D Panel itself has become a major cost item.) Studies of the reliability advantages of retaining the decoupled mode predictably show little advantage to the program other than assuring an ATM mission if the workshop is a complete failure. We are studying inhouse what curtailments of the program requirements are possible without severe impacts on the overall objectives and will report to you when results are complete. ✓

B1/21

NOTES 1-20-69 SIEBEL

1. AAP Payload Shroud: On January 17, 1969, the Payload Shroud Configuration Review was held by the Lead Laboratory Engineering Manager and IO. Subsequent to this meeting the drawings for the lower cylinder (test article) were released. We have been building and erecting tooling for some time and have been able to procure some long lead time articles before drawing release.

2. ATM Thermal Test Simulator: We are to fabricate a Thermal Test Simulator for the ATM project. The simulator consists of a mockup of the lower six feet of the ascent stage of the Lunar Module. It is constructed of a skin and stringer shell with spray foam as an insulating agent. P&VE is ready to start; drawings and requirements will be available in about two weeks. The Thermal Test Simulator is to be used in conjunction with the ATM All-Systems Thermal Test, which is scheduled to go into the Thermal Vacuum Chamber in November 1969.

3. ALSEP: We have built an ALSEP Neutral Buoyancy Simulator for MSC (funded by them) and are in the process of shipping it. This, the first of two simulators, is the overall package which will be used to simulate the package transfer from the LM to the lunar surface. A second simulator may be required which will allow the simulation of the actual deployment of the individual experiments on the lunar surface. We have no formal request at this time to take on this second task.

4. S-IC/S-II Test Structure: A work request has been received from P&VE requesting removal of the foam insulation from the S-IC/S-II Structure because corrosion has been detected under the foam. After foam removal, the surfaces are to be alodined and coated with Zinc Chromate to protect the structure.

5. Neutral Buoyancy Testing: The parallel rail concept of the ATM EVA translation study was tried. For this concept, two parallel handrails are attached at the EVA hatch of the ATM. The rails are used as translational aids to the astronaut while performing the EVA film retrieval task. The feasibility study of the parallel rail concept was completed January 16, 1969. This initial study indicates that redesign of the parallel handrails is required in congested areas such as the ATM strut area, the LM EVA hatch area, and the sun end work station. During the translations, difficulty was experienced with the management of the umbilical. A technique is necessary to prevent the umbilical from bumping the solar panels or becoming entangled with the solar panel racks. Additional development studies will be conducted in an effort to overcome the problems.

B 1/21

NOTES 1/20/69 SPEER

1. AS-504 Systems Interface Test (SIT): The AS-504 SIT was successfully conducted on Jan 16. An anomaly which occurred just prior to the last command sequence is being investigated; however, it is felt that this did not invalidate the test.

2. Mission Photography: While our photo requirements for all vehicle engineering are well covered through formal documentation (PSRD), there is an apparent gap on requests to obtain movies and stills taken by the spacecraft after L/V separation in adequate numbers and quality. We are working with Photo Lab and MSC to establish mutually acceptable requirement procedures for future missions.

3. AS-505 Manned Restart No-Go Criteria: We are proposing to relax the No-Go constraints for manned restart on AS-505 from those utilized on AS-503. This is possible due to the availability of the LM as a backup propulsion system in the event of premature S-IVB cutoff during the second burn. S-IVB propellants and other consumables would have to assure a one-sigma probability of guidance cutoff instead of the two-sigma required on AS-503. We would also attempt restart for any malfunction condition where there is no catastrophic hazard and where there is any possible chance of reaching guidance cutoff if the engine starts (on 503 we required at least a 50-50 chance). These revised criteria have been accepted in preliminary discussions with MSC.

4. Apollo Mission Planning: Although some of the Apollo mission planning conducted in MSC's Flight Operations Planning meetings does not affect MSFC directly, I feel it is important that we continue to participate. Here are three interesting items from the most recent meeting, Jan 16/17: (1) During the August launch window, a free return trajectory is not possible for a Pacific translunar injection. MSC will recommend a hybrid trajectory, maintaining the free return option for only 6 to 8 hours and a subsequent SPS maneuver optimizing for lunar orbit insertion. (2) Prior to LM separation in lunar orbit it is now planned to use the descent stage for transearth injection rather than SPS. The docked LM will be retained until shortly prior to re-entry as backup power and communications source. (3) In line with Apollo 8 experience, LM checkout in lunar orbit will be shortened and conducted in two parts to provide more flexibility and to give the crew more rest.

NOTES 1-20-69 Stuhlinger

B 1/21

No submission this week.

B 1/21

NOTES 1/20/69 TESSMANN

J-2 Turbopump Test Activities: We are activating the J-2 Turbopump lox system at T.P. 501 in order to assist P&VE in determining the suction line and turbopump dynamic characteristics of the S-II center engine configuration. In addition we will attempt to determine the cause of the pressure oscillation anomaly as experienced in the AS-503 flight. Flight configuration suction line arrived from S&ID over the weekend with testing scheduled to start the week of February 3, 1969.

S-IVB Battleship (MSFC): Test S-IVB-075 was conducted on January 17, 1969, for a 462 seconds duration. The engine performance was satisfactory and all objectives completed. The POGO study of S-II-503 center engine flight conditions was completed. Sustained 18 c.p.s. oscillations were generated at 5.5, 5.0, and 4.5 mixture ratios at low NPSH values. The lox pump discharge pressure magnification to 250 p.s.i. observed on S-II-503 could not be induced by shocking the pump inlet by gimbaling during the times the pump-induced 18 c.p.s. was present. Data are being evaluated. S-IVB lox tank pressurization module S/N 0006 was cryogenically tested with satisfactory results, and removed for use on S-IVB-505 at KSC.

S-II-7 (MTF): A combined tanking and cryogenic proof pressure test was successfully conducted on S-II-7 at the MTF A-1 Test Stand on January 15, 1969. The acceptance static firing test is scheduled for January 22, 1969. Additional instrumentation is being installed for the test to gather data concerned with the AS-503 center engine oscillations.

Orbital Workshop Insulation: The second phase of testing of the OWS insulation was initiated on January 16, 1969. The test was terminated on January 17, 1969, because of problems encountered with the test item. The problems will be worked out the week of January 20, 1969, and the nine day test rescheduled for the following week.

F-1 Engine: Test FW-106 was successfully conducted on January 17, 1969, for a duration of approximately 135 seconds. Data are being evaluated.

Termination of Notes: This will be the last issue of these notes under the above heading. Next week all items will be merged with those from P&VE under NOTES ---Heimburg.

B 1/21

NOTES - WILLIAMS - 1/20/69

1. Space Station & Logistics: The Sixth Consolidated Draft of the Statement of Work was obtained. Dr. Paine is generally looking for a much more ambitious design of a space station. For this reason, an operational life of 10 years has been established as a goal. The station module must be studied as to its capabilities for providing an artificial "g" environment. Only the maximum candidate experiments program will be furnished to the contractors for experimental operations. The matrix of initial program possibilities has been reduced to only the S-IC/S-II and S-IC/S-IVB vehicle configurations for space station launch and to the Titan IIIM and a new solid motor first stage with the simplified S-IVB upper stage. A reusable "space shuttle" will be considered for crew rotation and logistics. The space station design should provide ample future growth capabilities. Particular emphasis has to be placed on consideration of minimum cost over the total program life. Operating modes which fulfill this requirement should be developed. In order to accomplish this latter objective, a new special emphasis sub-task has been added in view of the unique importance of low operating costs: "Evaluation of cost reduction techniques." ✓

F.W. I'd like to attend at least some of these B

A number of presentations by Aerospace Companies have been arranged to be held on Jan. 23, 24, 29, 30, and 31. The purpose of these presentations is to present to MSFC personnel recent work which has been done in low cost earth orbit transportation such as the "stage-and-one-half" or "space shuttle" type systems. Major trade-offs involved in system selection, the development required, and the cost and schedules will be discussed. Announcements are being mailed. ✓

2. B_o Station Study: MSC requested a briefing to be given in Houston on Jan. 22. We were informed that Dr. Faget mentioned the briefing to Mr. Don Hagler, Bellcomm, and he will attend. Mr. Hagler apparently indicated that Dr. Mueller had discussed the idea with him and a Bellcomm study may be made. ✓

3. Lunar Roving Vehicle (LRV): The LRV evaluation team meets next week at MSFC to evaluate the technical proposals. We have received all 1122 forms for LRV FY69 supporting development studies. A meeting is planned with the LRV Management Team (the week of Jan. 27) to define tasks that MSFC should request. ✓

Jan 27, 1989

1/31

NOTES 1/27/69 BALCH

MISSION:

S-II-6 - Removal from Vertical Checkout Building has been rescheduled from 1/23/69 to 1/29/69 because of delay in completion of LH_2 feedlines, a moisture problem at the No. 6 cylinder to forward skirt insulation closeout, and a special test of engine propellant utilization valves required as a result of problems with these valves during the AS-503 countdown. The special propellant utilization valve test was performed on 1/25/69, and the valves failed to meet performance criteria on three engines. Stage is now expected to be ready to ship to KSC on 1/31/69.

S-II-7 - A full-duration static firing was successfully accomplished on 1/22/69. During this firing, low amplitude 15 to 17 Nz oscillation was recorded on the center engine LOX pump inlet pressure measurement and on accelerometers located on the center engine thrust pad and LOX tank aft bulkhead. The oscillation became sustained at between 315 and 320 seconds into the firing, with the engines operating at low mixture ratio. Preliminary evaluation indicates that the proposed LOX tank step pressurization at 150 seconds will not maintain NPSH above the oscillation band during low engine mixture ratio operation. The special engine propellant utilization valve test required as a result of problems with the valves during the AS-503 countdown was performed on the S-II-7 stage on 1/26/69, and performance was satisfactory on all engines.

S-IC-9 - "Power-up" has been rescheduled from 1/29/69 to 1/27/69, with static firing still planned for 2/19/69.

BOMEX - We will have two people aboard the ship "Discoverer" during the participation in the Atlantic Tradewind Experiment (ATEX), to communicate with us concerning any operational problems which may develop with the Signal Conditioning and Recording Devices (SCARD'S).

We have been advised that the Slidell Computer Center will assist us in digitizing analog data. This is particularly important since the availability of processed data during the operational period is basic to analysis and program changes.

GENERAL:

Legal Affairs - A total of 35 complaints have now been received alleging damages as a result of the static firing on the S-IC-8 stage on 12/18/68. Two of the complainants have now alleged that they have had additional damage as a result of the static firing of the S-II-7 stage on 1/22/69.

B 1/31

NOTES 1/27/69 BELEW

OPERATION OF ACE: Meetings have been held with the labs and with KSC to discuss the proposed inter-Center MSC/KSC/MSFC agreement covering the use and operation of ACE. Considerable progress has been made toward agreement. After a little more work, it should be ready for signature.

ATM CHECKOUT SYSTEM: The GE proposal for the ATM checkout system was received this week in the Contracts Office. It is necessary for the three-Center agreement to be completed before the evaluation of the proposal can be completed. This proposal covers the period from June 1969 through program completion.

INTERNATIONAL ASSOCIATION OF MACHINISTS STRIKE AT MDAC-EASTERN DIVISION: No resolution is in sight for the two week old strike of the IAM at MDAC, St. Louis, Missouri. At present, the strike is causing only a slight impact on the Airlock Program, with slippage of the structural test unit delivery.

SYSTEMS ENGINEERING: Since the organization and operation of the total MSFC Systems Engineering team may take some time and since AAP has several major systems problems that need immediate attention, we are planning to sit with Dr. Haussermann and Ludie Richard to pinpoint our critical needs and discuss what arrangements can be made to give these items the needed effort. Perhaps an ad hoc team will be necessary pending final R&DO personnel appointments and organizational interfaces.

AIRLOCK MODULE: MDAC-Eastern Division has been requested to provide firm cost proposals for the following additional items: (a) WACS Electronics - Installation and integration of GFE WACS control equipment on the Airlock Module; (b) Delete Experiments T-017, Meteoroid Impact and Erosion, and T-021, Meteoroid Velocity. Add the following experiments for operation in the Scientific Airlock which will be located in the Airlock structural transition section: S018 - Micrometeorite Collection, S019 - UV Stellar Astronomy, S020 - UV X-ray Solar Photography, S063 - UV Airglow Horizon Photography, S073 - Gegenschein/Zodiacal Light, T025 - Coronograph Contamination Measurements, and T027 - ATM Contamination Measurements; and (c) Provide for Multiplexers to support MDA measurements on the Airlock Module.

NOTES 1-27-69 BROWN

F-1 ENGINE - Reference my notes of 1-20-69 concerning engine F-6059 S-IC-8 which has an erratic primary LOX pump seal. Because of schedule considerations, spare engine F-6078 will be installed in the stage, rather than to replace the seal as previously planned. It is felt that changing out the engine does not significantly increase the technical risk. Engine F-6059 will be repaired and become a spare.

J-2 ENGINE - Investigations of the P.U. valve problem encountered on AS-503 are continuing. In addition to the "in-place" functional tests which are being conducted on valves installed in the various stages, a detailed study of the electrical interface critieria has been made. Both McDonnell Douglas and Rocketdyne have performed independent computer/circuit/motor analyses. These analyses have shown that the computer does not supply the proper voltage and phase angle to develop the presently specified minimum torque in the P.U. motor; however, adjustments have been made to maximize the available torque for AS-504. In addition, a series of P.U. valve/S-IVB stage computer tests have been planned to explore the torque problem in an effort to establish better interface criteria. These tests are to be performed by Rocketdyne. However, start of testing has been delayed pending receipt of the stage computer from MDC and authorization of supporting MDC personnel.

CONSTAN NOTES 1/27/69 B 1/31

Nothing of special significance.

B 11/31

NOTES 1-27-69 Downey

1. AAP CONTAMINATION PROGRAM: Recently Mr. David Novik and Mr. Robert Dunning from OART visited SSL to review the status of the ground-based contamination program for ATM/A and other elements of the core program. Additional presentations to them included the possibility of preparing flight experiment T030 (mass spectrometer) for AAP-2 and an integrated optical contamination package for the 1975 Space Station. (The mass spectrometer experiment was rated as the highest priority contamination experiment by the Ad Hoc Contamination Committee in its report to the MSFEB. There is a desire to implement this experiment as soon as possible. The T030 mass spectrometer is a slightly modified version of the University of Michigan instrument flown on OGO. Although the instrumentation is in an advanced state of development and believed to be compatible with AAP-2, it would take an extraordinary effort to incorporate the experiment on AAP-2 at this late date. Funding and documentation would be problems, and AAP-2 is already overloaded with experiments.)

2. OSSA PHYSICS AND ASTRONOMY PROGRAM: Mr. Marc Aucremanne wants to schedule a meeting between Mr. Jesse Mitchell and others from Mr. Mitchell's office and appropriate persons in MSFC management to discuss the Center's possible future involvements in physics and astronomy programs. (Mr. Aucremanne is responsible for Advanced Programs and Technology within the Physics and Astronomy Program Office of OSSA.) I told Mr. Aucremanne that we would be very pleased to have such a meeting. I believe the meeting should take place no sooner than March 1, at which time our reorganization will be better defined. I will inform Dr. Lucas of Mr. Aucremanne's request and discuss this matter with him.

NOTES 1/27/69 GEISSLER

B 1/31

1. Flight Limits Sub-Panel (FLSP): The fifteenth meeting of the Saturn/Apollo FLSP (of the Flight Mechanics Panel) was held at MSFC on January 17, 1969. During the meeting, two changes for AS-504's manual abort logic were recommended. First change: Use 5° pitch or yaw attitude error as a first cue during the S-IC flight phase. This provides an early cue for the loss of attitude error signal malfunction. The second abort cue will be the delta P indicator. A 5° roll error was already planned as a first cue mainly for an actuator hardover failure. Second change: For a S-IC control engine out prior to 50 seconds, ignore delta P as an abort cue. Recent analyses indicated that with a S-IC control engine out prior to 50 seconds, it is possible to exceed the delta P limits (3.2 psi) and not lose control or exceed the structural limit. Therefore, without this change it was possible to get false abort indications. There are no additional risks associated with this change, since after tower clearance, an engine out prior to 50 seconds does not result in an abort requirement during the max q region. The Crew Safety Panel has officially approved these recommendations. Detailed meeting minutes are being prepared. ✓

2. Cluster Contamination Analyses: There has been considerable concern among some of the ATM Principle Investigators that the effectiveness of their experiments to collect scientific data might be reduced due to contamination. This Laboratory has been working to try to determine the environment surrounding an orbiting spacecraft while various types of ejecta are being introduced into the immediate surroundings. Of immediate concern to ATM has been the contaminants which result from: (1) RCS thruster firings, (2) Liquid dumps, (3) Leakage from pressurized compartments, (4) Material outgassing, and (5) Particulate (dirt etc., resulting from manufacturing and handling). Of the above, Aero-Astrodynamics Laboratory has been concerned with the first three. Plume data has been generated for all the engines present on the AAP cluster mission. We are presently investigating the behavior of liquids ejected into a space environment. A working group is being formed to aid in evaluating the present contamination problems, and we shall support it. ✓

3. Environmental Documentation Preparation: Final version of the Earth Orbital Atmospheric Monograph was completed for OART by personnel of our Aerospace Environment Division. It is to be published as a NASA Headquarters Criteria Monograph in March 1969. Specialized environment criteria data for use in support of the OWS/ATM and Future Space Station Programs have been furnished to various engineering and scientific groups. To furnish these data in the future in a more systematic manner, a document entitled "A Discussion of Natural Space Environment Criteria for MSFC 1971 - 1976 Orbital Space Station Programs" is currently being written. It will assist the user in determining the environment criteria requirements for a particular engineering or scientific study; it will also contain predictions of the mean orbital atmospheric density, pressure, and molecular weight to which a spacecraft will be exposed on particular days (at 3 month intervals) from January 1, 1971 through January 1, 1977. ✓

Cor

NOTES 1-27-69 GRAU

B 1/31

1. AAP RELIABILITY ANALYSIS: An engineering and reliability analysis is being performed on the electrical systems of the ATM and the S-056 experiment. The analysis includes a failure mode and effect analysis, a worst case electrical stress analysis, a functional analysis and a numerical reliability prediction for each system. Several problem areas have been found in the evaluation of the designs for these systems. The problem areas have been discussed with the design engineer and in most cases corrective action has been initiated. The effect and seriousness of the other problems are presently under investigation. Changes which have been incorporated into the design have improved the reliability of the systems significantly. ✓

2. X-RAY FACILITY IMPROVEMENTS: Installation of a Dana Overhead Suspension Device and a Norelco MG300 Industrial X-ray Unit in the X-ray bay, building 4707, has been completed and the facility is now operational. The suspension system provides motorized vertical, longitudinal and transverse movements for the X-ray tube, and with the more powerful MG300 tube will materially increase our capabilities and efficiency in meeting future X-ray requirements. ✓

3. PROPELLANT UTILIZATION PROBLEM: A meeting was held recently among North American Rockwell Space Division, Rocketdyne, R-ASTR, R-QUAL, and I-V-SII to discuss the S-II propellant utilization (PU) problems. It was concluded that the S-II PU computer is underdesigned. Action is underway to redesign the entire valve control servo within the PU computer, including the power supply. The S-II Sub Group, Systems Checkout Working Group, has completed the review of S-II PU system checkout as presently being performed and has recommended by letter to the Stage Manager's Office that several changes be made. ✓

NOTES 1/27/69 HAEUSSERMANN

B/131

1. ATM Fine Sun Sensor. A Critical Design Review (CDR) was held last week on the fine sun sensor at Honeywell in Boston. No major discrepancies were uncovered during this review and the design appears to be in good shape. Dr. Tousey of NRL and Dick Forsythe of NASA Headquarters participated in this review.

2. ATM Hydrogen Alpha Telescopes. A meeting was held last week with Dr. Reeves of Harvard College Observatory (HCO) to discuss and resolve technical problems associated with the H Alpha telescopes. Specific areas were:

a. A standard vidicon TV system would be used rather than the low light level TV system at the expense of a slight loss in the field of view but with added reliability and reduced cost.

b. Photographic results from the Lockheed Solar Observatory have shown that the matching of the optical elements presents a state-of-the-art problem in that aging of the blocking filter elements is not very predictable. Further investigations will be made by HCO and Perkin-Elmer (fabricator of the H Alpha telescopes) on this problem.

c. Present positioning of the optical elements is not optimum with respect to maximum photographic quality. However, cost, schedule and interface impacts are prohibitive at this time to consider a redesign of the H Alpha telescopes.

3. ATM Review. Messrs. Forsythe and Culbertson of NASA Headquarters plan to visit with us on ~~January 31~~ Feb. 5. This is to be an informal session with the emphasis on seeing the ATM hardware which has been delivered and a discussion of the general status of the program.

4. Optical Technology Workshop Meeting. In connection with the optical technology meeting being planned by Dr. Stuhlinger, we have nominated Messrs. William Chubb and Charles Jones of the Astrionics Laboratory to be speakers at the session on pointing and stability.

5. Saturn Control Computer. IBM has reported an intermittent failure on Flight Control Computer S/N 104(AS-506) which was discovered during simulation lab testing being conducted at IBM-Huntsville. The computer was returned to ECI where it was subjected to troubleshooting and failure analysis and the failure was isolated to a relay driver transistor. It is not known at this time if a lot problem is involved.

NOTES 1-27-69 HEIMBURG

B 1/31

1. AAP -2 GENERAL: R&D is presently reviewing the combined McDonnell Douglas Aircraft Company (MDAC) contract scope with a scheduled completion date of 1-30-69. The scope of this contract represents $247M and appears greatly expanded ($115M at MDAC/St. Louis and $132M at MDAC/Huntington Beach). In other terms, we are reviewing $25M of AAP prime contractor cost per day of review time. The short time available makes a complete review almost impossible and we are greatly concerned about the quality and validity of our evaluation. We may later on regret not having taken more time for this effort.

Lee Below FYI B

2. J-2 ENGINE OSCILLATIONS: A test program conducted at MSFC has shown that J-2 engine oscillations as observed in S-II-503 flight are related to LOX pump NPSH. Oscillations were initiated or damped by decreasing or increasing NPSH respectively. An Engineering Change Request has been issued to increase LOX ullage pressure on S-II-504 by adding a pressurization step at time base 3 + 100 seconds. The increased pressurization will preclude operation at the LOX NPSH levels at which pump oscillations were encountered during flight of S-II-502 and S-II-503.

3. S-II-3 and S-II-4 CROSSBEAM: We have looked into the possibility of adding ballast weight to the crossbeam, as suggested during the LDX meeting. It would have required approximately 4000 lbs. to be added to the S-II-3 gimbal block location; a smaller amount would be required for S-II-4. However, it is physically impossible to locate such a weight on the gimbal block and a distributed weight is only partially effective.

4. BIOMEDICAL EXPERIMENTS: (a) Mr. Ken Hecht is now Assistant Chief for Engineering in the Biotechnology Office of the MSC Medical Directorate. As Assistant to Dr. Armstrong, he will become intimately involved in our biomedical experiments activity. (b) USVMS Demonstration: About 20 MSC personnel saw the demonstration, including Doctors Armstrong, Fisher, Rambaut, Wheler, Johnson, and others. IO and MDAC personnel also attended. The presentation went well and was favorably received. This concerned the same instrument we showed you in our Materials Division last week.

K.H. 2. Please avoid such abbreviations B

5. AAP HARDWARE RESPONSIBILITY AND INTEGRATION: We have been seeking a decision as to MSFC's role in docking hardware integration. If MSFC is responsible for docking hardware to function properly in space, we and R-QUAL have outlined a program to implement our requirements for checkout operations and equipment. If MSC is responsible, our equipment will be much simpler. The problem is becoming urgent as we (R&D) need to begin design and manufacturing of the equipment.

Lee Below Hope this is clarified soon B

6. MSFC SKIN-STRINGER PAYLOAD ENCLOSURE: Acoustic testing on a 36" X 36" skin-stringer ring-frame shell has been completed. The purpose of these tests was to evaluate skin-stringer ring-frame noise reduction characteristics as opposed to that of the previously tested monocoque shells. These tests were accomplished with and without a helium purge. As expected, the panel edge and corner mode acoustic radiation was much greater than that of the monocoque shell. Even though the acoustic energy radiated into the inner volume was much greater than previously experienced, the helium purge still gave an 8 dB noise reduction. This additional testing has given increased confidence that the higher acoustic levels of the payload enclosure can be adequately attenuated.

B 11/31

NOTES 1-27-69 HOELZER

Negative Report.

NOTES 1-27-69 JAMES

B 1/31

1. AS-504 Reviews: Triannual review meetings and AS-504 Readiness Reviews were conducted at McDonnell Douglas, North American Rockwell and Boeing the week of January 20. Two AS-504 issues requiring decisions were covered on S-II-4. Additional instrumentation changes were authorized to increase the 18 Hertz response on engine measurements and a backup flight tape is being prepared to initiate an additional LOX tank pressurization step to alleviate the S-II center engine oscillation problems. The additional measurements have been authorized through Level I, and the tape change will require the same approval since some schedule impact will occur if the tape is changed. ✓

2. S-IC-8, F-1 Engine Changeout: Upon return of S-IC-8 from MTF, a leak was detected on engine #6059 (installed in position #4). Technical judgement of P&VE, Rocketdyne, and the F-1 Engine Project Office advised that the main LOX seal should be replaced. To avoid impact on S-IC-8 delivery with subsequent domino reaction to succeeding stages, engine #6059 was replaced by spare engine #6078 January 25, 1969. Rocketdyne personnel at Michoud, experienced in this area, will perform failure analysis and replacement of the main LOX seal in engine #6059. ✓

3. Saturn V Platform Backup in Spacecraft: (Reference Notes James 1-13-69) Chris Kraft called January 22, 1969, and stated MSC was unable to incorporate polynomials for all three stages for AS-505. Additionally, the MSFC assessment shows that we would have a significant software impact. It was decided to change the effectivity from AS-505 to AS-506 and MSC has been advised accordingly. ✓

4. Clerical Personnel Shortage: Clerical assistance throughout the Saturn V Program has been reduced to the critical level and some measureable relief is needed very soon. ✓

5. Apollo Crew Briefings: MSFC personnel briefed the Apollo 10 prime, backup and support crews for Apollo 10 at MSC January 20, 1969. Those participating in the briefing were Mr. Hammers, R-ASTR; Mr. Swalley, R-P&VE; Mr. Wittenstein, R-AERO; Mr. Edwards, R-SE; and Mr. Beaman, I-V-E. An updated briefing for Apollo 9 crew will be given at KSC January 29, 1969. ✓

NOTES 1/27/69 JOHNSON

B 1/31

Research Achievements Review (RAR) - Our next RAR will be held Thursday, January 30, and will cover Thermophysics Research at MSFC. Topics of discussion will range from thermal control coatings to thermal conductivity of powders, and will include such topics as solar wind effects and heat pipe technology.

This RAR will be recorded on video tape for possible use by Edward Mohlere as a means of informing colleges and universities of the Center's research activities.

Status Report on Dr. Kraushaar's Galactic X-Ray Mapping Experiment - The flight hardware for the originally proposed flight experiment (SO27) is complete and in controlled environmental storage at Spacecraft, Inc., Huntsville, Alabama.

An Experiment Implementation Plan (EIP) for the up-dated, soft x-ray version (S 150) is in final draft form and will be ready for presentation to the MSFEB at its March meeting. Since this version has the approval of OSSA and will replace the SO27 flight hardware on AAP-4, there is no reason to expect that the experiment will not be approved by the MSFEB unless the availability of funds becomes a matter of concern to the Board. The EIP indicates that $350,000 will be required to provide the flight hardware for the up-dated, soft x-ray version of the experiment.

NOTES 1/27/69 MAUS

B1131

INSTITUTIONAL PLAN

An MSF in-process review of the MSC Institutional Plan was conducted at Houston on January 22, 1969. Representatives from MSF, MSFC and MSC attended. Headquarters representatives expressed their satisfaction of the progress being made by the three MSF Centers thus far. They plan on making one more swing through the Centers during the week of February 10th, to take a more detailed look at the plans to be submitted. MSC did not state which of the new MSF programs, contained in the guidelines, they wish to participate in. They did indicate, however, that they plan to at least continue with the same type of activities they have had in the past (Mercury, Gemini, etc.). Their main problem is in selecting those programs that can be performed within their expected future resource availability.

BACK-UP INFORMATION FOR MSF USE IN THE CONGRESSIONAL HEARINGS

MSF has requested Marshall to furnish manpower information to be used as back-up for the FY-70 Congressional Hearings. To be included in our submission is the personnel reductions (Civil Service, Support Contractors - including Facility Operations, and Prime Contractors) by skill category for FY-68, 69 and 70, and the effects of these reductions on Marshall's programs.

Work is in process to support the January 31, 1969, submittal date to MSF.

NOTES 1/27/69 MOHLERE

B 1/31

Negative report.

NOTES 1/27/69 MURPHY

B 1/31

Negative report.

NOTES 1/27/69 RICHARD

B 1/31

No submission this week.

NOTES 1-27-69 SIEBEL

B 1/31

1. MDA: The structural test article is back in our shops for final work. The R-QUAL pressure test results were very good. Leakage rate was extremely low - 0.012 psi per 24 hours pressurized at 5 psi. Maximum deflection occurred below the radial ports amounting to 0.16 inch increase in the circumference. We are now projecting completion of article including installation of strain gages by February 28, 1969.

2. Neutral Buoyancy Tests:

a. ATM Trolley System: An engineering evaluation of the trolley translator system has been conducted. Measurements were taken to determine the maximum torque applied to the rail during operation of the trolley. Data acquired from this program will be used to establish design requirements for the flight version trolley system.

b. ATM Parallel Rails Evaluation: A feasibility study was completed and a flash report issued on the parallel rails concept for astronaut translation over the ATM. As reported previously, some interference problems were identified; however, the feasibility of the approach was established. The rails are being modified to incorporate a device which will slide along one of the rails for transferring film cassettes from the LM to the LM and sun end workstations.

c. Presentations: This week a thirty minute TV tape covering the N.B. simulator was assembled for showing on several regional television stations. Several underwater test shots from existing tapes were included. The tape will appear on the "Alabama in Space" series.

Preparations were made in cooperation with the Public Affairs Office for representatives of the National Geographic Society to tour and photograph N.B. operations in order to gather information for a proposed article to appear in the National Geographic Magazine.

3. Space Manufacturing: Mr. Stan Smolensky from NASA Headquarters, Office of Policy, visited us to review considerations for NASA/Industry cooperation in the utilization of space technology. He was specifically interested in the potential of Industry/NASA cooperation as it relates to space manufacturing. He is interested in guidelines for NASA to follow in regard to proprietary rights, the joint use of facilities, etc. We told him about the present very early stage of our space manufacturing endeavor. In our contacts with Industry, however, such guidelines would be useful to have.

NOTES 1/27/69 SPEER

B 4/31

1. Apollo 9 (504) Flight Mission Rules Review: This review was held by telecon with the new Mission Director (Hage) on 1/22. MSC is planning on seven discrete launch times, 30 min. apart (starting at 11:00 a.m. EST) to facilitate the LM rendezvous maneuvers. All agreed that the L/V command system would be mandatory for launch. After some discussion it was also agreed that the crew will make the final decision to proceed with CSM docking in the event of a L/V anomaly. We accepted an action to define more specifically any contingency conditions preventing S-IVB restart.

2. AAP Operational Constraints: In the last AAP Flight Operations Planning (FOP) meeting at MSC a tight schedule was established for the initial compilation of AAP "operational constraints." Subsequent to the FOP, an internal meeting was held and a team of I-S/AA, R-SE and I-MO personnel was established to compile MSFC's input to an "Operational Constraints Document" being generated at MSC. A series of meetings with both our contractors (including MDAC-E and GAEC) and cognizant MSFC personnel will be held the week of January 27 to define operational constraints and insure commonality in MSFC's approach. A target date of February 28 has been agreed to.

3. AOG Meeting: Our office was host to the Aircraft Operations Group (AOG) meeting here on January 22 and 23. This group is responsible for establishment and coordination of Apollo Range Instrumentation Aircraft (ARIA) operations. We requested continuous S-IVB/IU support during revolutions 2 and 3, while the spacecraft is performing transposition, docking and extraction. The ARIA nominally provides only post-mission recorded data, but in the event of a launch vehicle anomaly covered by ARIA, the recorded data can be dumped to a real time site for post-pass display at the BSE console. Apollo 8 data evaluation by R-COMP has shown ARIA support was excellent.

4. Lunar Rover Vehicle (LRV): We participated in the LRV Phase B Study contractor evaluation by supporting the Advanced Systems Office in evaluating mission operations aspects of the proposals. This evaluation was supported by operations personnel from JPL and MSC.

5. Apollo Mission Planning (correction): Dr. Rees made me aware of a misleading statement in my Notes last week: The use of the LM descent stage for transearth injection from lunar orbit is only considered in contingency situations when, for some reason, LM descent to the lunar surface is not possible. The normal F and G mission sequences related to ML separation in lunar orbit have not been changed.

NOTES 1-27-69 Stuhlinger

B 1/31

1. OSSA SENIOR COUNCIL MEETING ON JANUARY 23-24 AT MSC: Agenda items included a SRT review (OSSA desires to retain task-by-task approval, but may consider discretionary funds for Centers); the Grand Tour mission (NASA should consider it as a program with a variety of flights); a review of MSC's inhouse science program (besides the Lunar Receiving Lab, lunar exploration, and earth resources study, MSC has a lively program of rocket and balloon flights to study cosmic rays, radiation belts, air glow, and aurora), and a very impressive show of Apollo 8 pictures of the earth and the moon. A detailed trip report will be distributed. Copies are available by calling 6-4625. ✓

2. MANNED ASTRONOMICAL SPACE TELESCOPE (MAST): A mid-term review of this study by Kollsman was held at GSFC on 1/21. Guidelines for the study envision a 92 cm (37") telescope (as proposed by GSFC) on a module which remains docked to the MDA of a space station. Functions of the astronauts, and merits of a continuously docked module as contrasted to a detached module, were discussed during the review. Details of the discussions are reported in a trip report, available by calling 6-4625. ✓

3. X-RAY TELESCOPE SATELLITE: A study on this project was recently initiated by OSSA (Dick Halpern) with MSFC responsible for study project management (Astrionics) and three potential PI's responsible for experiment definition (R. Giacconi, AS&E; G. Clark, MIT; and R. Novick, Columbia). Dr. Giacconi recently expressed dissatisfaction with the way this study has been planned by NASA. I discussed this matter with Giacconi and Clark in Boston, and with Naugle, Nicks, Smith, and Jack Clark during the OSSA Senior Council meeting of MSC. More effort will be needed to resolve the differences. I would like to brief you on some of the details before your visit to AS&E next month.

E.S. Please arrange B

NOTES - WILLIAMS - 1/27/69

B 1/31

1. A series of contractor presentations has been scheduled in order to familiarize MSFC laboratory and staff personnel with the results of recent studies in the areas of low-cost launch and re-entry vehicles and the considerations of various L/D ratios. Presentations by Martin and North American Rockwell have taken place; others by General Dynamics, Lockheed, and McDonnell Douglas are to follow this week.

2. On January 20, 1969, the Missile Division of Chrysler Corporation presented their work on the Chrysler National Booster Study and on activities in the area of earth orbital experiments. Both presentations related Chrysler's effort to the upcoming Phase B space station study and the experiment module study.

3. A space station mockup is being prepared in ME Lab. It will consist of three floors, ceilings, and inner walls, internal equipment (consoles black boxes, etc.) to simulate the experiment and subsystems floors. Crew quarters' equipment is not yet completed. Internal equipment and partitions are being installed; it is estimated that the mockup will be complete by the end of February.

4. The Seventh Draft of the Statement of Work for the Phase B Program Definition Space Station has been reviewed. MSFC's comments have been compiled and a letter to Dr. Paine has been prepared and will be presented at the meeting on January 27, 1969, describing a broader and more ambitious space station program than was originally visualized. The impact of this bold, long-range program on the remainder of the workstatement is being evaluated now. You will be apprised of any potential problem areas.

5. Integral Launch and Re-entry Vehicles (ILRV) Studies: We understand that a letter has been transmitted from MSF to MSFC, MSC, and LaRC, authorizing go-ahead on four ILRV studies at $300K each. One study is to be directed by MSC, one by LaRC, and two by MSFC. The letter specifies MDC contract to Langley, NAR to MSC, and Lockheed plus GDC to MSFC; and, specifies areas for emphasis in each contract. Negotiations with the four contractors are to begin at MSC on January 27, 1969; MSFC will be represented on the NASA joint negotiating team.